AUTOMOTIVE INDUSTRIES

PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT • SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

FEBRUARY 1, 1950

In This Issue . . .

Machining Ultramatic Transmission Castings
Model Y — New Dodge Truck Series
European Torsion Bar Suspension Systems
High Vs Low Octane HC Engines
Highlights of SAE 45th Annual Meeting

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A CHILTON PUBLICATION

What's YOUR problem?

R. L. Jenkins, lubricating specialist at Standard Oil's South Bend office solved this customer's problem because he was thoroughly familiar with job requirements and the application of his Stanorust line.

● There is a corps of such lubricating specialists throughout the Midwest, trained and experienced to help plant operators solve similar problems. Experience enables these men to find quickly the cause of lubricating troubles. Knowledge of petroleum products enables them to prescribe the lubricant needed. There is one of these lubricating specialists at the Standard Oil Company (Indiana) office near you. He is there to serve you. A call or a card will put him at your service.

Investigate the cost-saving possibilities of these lubricants.

STANOIL INDUSTRIAL OILS—for cleaner hydraulic systems, gear cases, compressors, and circulating systems.

CALUMET VISCOUS LUBRICANTS—adhere to open gears and chain drives without throw-off. Easy to apply. No heating.

STANOLITH GREASE—withstands high temperatures and resists washing by water.

THE SHOP FOREMAN of Hart Pressed Steel Corp., Elkhart, Indiana, exposes the clean metal surface beneath a coating of STANORUST 1-XC Rust Preventive by a simple wiping operation. The die shown has been protected against rust under severe outdoor conditions for over a year by STANORUST 1-XC.

How to prevent rust under severe outdoor storage . . .

RAIN, snow, heat, cold—plus coal soot from passing locomotives—could be expected to produce serious rust troubles in outside storage. The elements did, indeed, cause difficulties for the Hart Pressed Steel Corp., Elkhart, Indiana, which owns the truck and trailer dies shown above. Despite coatings of heavy oil, rusting was so severe that cleaning a die required at least three hours.

The problem was laid before a Standard Oil lubrication specialist. He pointed out that, to withstand severe outdoor exposure, a rust preventive with special qualities is needed. At his suggestion, the dies were coated with STANORUST 1-XC, a rust preventive especially developed for severe outdoor service.

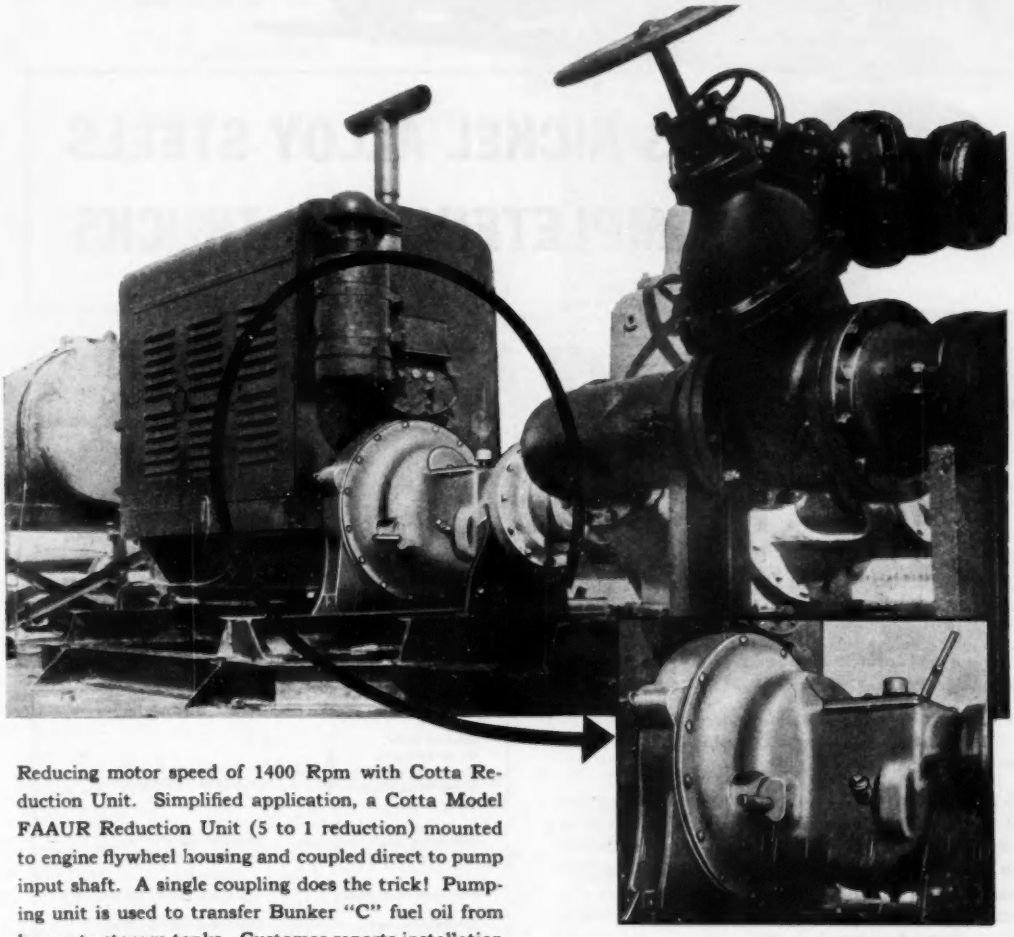
Use of a STANORUST Rust Preventive has made savings for this company. Many of the dies have been exposed to the weather for over a year, yet STANORUST has kept them completely protected against rust. A die can now be cleaned and returned to service in a matter of ten minutes, as compared with the three hours previously required.

The new and improved STANORUSTS can mean big savings for you through more economical applications, better rust protection. There's a lubrication specialist near you who can help you get the most economical results. How you can obtain his services is described at left. Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANORUST
REG. U. S. PAT. OFF.
RUST PREVENTIVES

STANDARD OIL COMPANY (INDIANA) STANDARD

Simplified—Economical Pump Drive with COTTA *Reduction Unit*



Reducing motor speed of 1400 Rpm with Cotta Reduction Unit. Simplified application, a Cotta Model FAAUR Reduction Unit (5 to 1 reduction) mounted to engine flywheel housing and coupled direct to pump input shaft. A single coupling does the trick! Pumping unit is used to transfer Bunker "C" fuel oil from barges to storage tanks. Customer reports installation is "very good looking . . . highly satisfactory". What speed reduction problem do *you* have?

Cotta Reduction Units come in a broad range of ratios, with input torque from 150 to 1350 foot pounds. For use on cranes, shovels, rock crushers, pumps, generators, etc.

THIS INFORMATION WILL HELP YOU

Diagrams, capacity tables, dimensions and complete specifications sent free on request. Just state your problem — COTTA engineers will help you select the right unit for best performance. May we work with you?

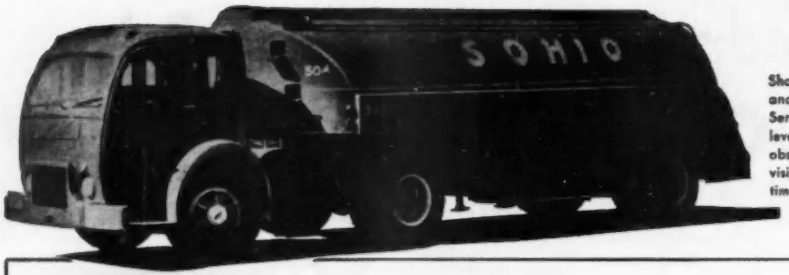
COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS

An Assurance of Dependable Service

COTTA

HEAVY-DUTY REDUCTION UNITS

"Engineered-to-order"



Shorter wheel-base, overall length, and turning radius of the White 3000 Series trucks . . . in addition to curb-level step, roomy cab with no floor obstructions, and greatly improved vision . . . contribute to considerable time-saving in traffic.

White USES NICKEL ALLOY STEELS IN COMPLETELY NEW TRUCKS

...Built to Cut Unit Delivery Cost

White Motor Company produces the new 3000 Series in three models with options that make it adaptable to a wide range of services.

Here is a fundamentally new design in motor trucks . . . the White Super Power 3000 Series...built to cut delivery costs.

As a result of White Motor Companys' 50 years of experience in truck manufacture, nickel alloy steels are widely used for vital parts.

A power-lift cab provides complete accessibility to engine and front end parts in less than 30 seconds at the turn of a key. The cab position allows scientific load distribution, with a heavier front axle carrying more of the weight. This permits hauling up to 3000 pounds more payload than conventional designs, in highway operation, under the majority of state laws affecting axle loading.

Like previous White truck models, the new 3000 Series utilizes nickel-containing alloys for a wide variety of parts, as indicated in the table. White Motor engineers know from experience that nickel alloyed steels and cast irons provide superior performance and good fabricating characteristics.

Investigate how nickel alloys may help you improve your products or equipment . . . or possibly cut fabrication costs. Send us details of your problems for our suggestions. Write us today.

Part	Material
Steering parts Connecting rods Connecting rod bolts Motor hanger bolts Valve guides	Nickel-chromium steels, quenched and tempered
Differential gears and spider Rear axle driving pinions	Nickel-chromium steels, case hardened
Rear axle drive gears	5% nickel steel, case hardened
Transmission gears	Nickel-molybdenum steel, case hardened
Driving axle	Nickel-chromium-molybdenum steel, quenched and tempered
Valves	High chromium-nickel alloy steel
Cylinder block Exhaust manifold Timing gears Brake drums Clutch plates Flywheel	Nickel-chromium cast iron

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

AUTOMOTIVE INDUSTRIES

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SHEET METAL RADIATORS

Specially Engineered . . . Line Produced

Young stamped tank and side member type sheet metal radiator. Used on power units, tractors, automobiles, trucks and similar installations.

THERE'S A YOUNG RADIATOR FOR EVERY AUTOMOTIVE APPLICATION

Plant facilities, production skill, and engineering experience combine at Young to mass produce radiators with custom-built quality. Such primary considerations as: care in original design to insure proper mounting support for most rigorous service, careful design of tools for accurate fitting of all components, and latest equipment and techniques, add up to maximum efficiency at minimum initial cost. Young offers the advantage of two decades' specialized experience and recently enlarged production facilities to design and manufacture the proper heat transfer equipment to meet your requirements.

YOUNG

HEAT TRANSFER PRODUCTS

T. M. REG. U. S. PAT. OFF

YOUNG RADIATOR CO.

General Offices: Dept. 109-B, Racine, Wisconsin

Plants at Racine, Wisconsin, and Mattoon, Illinois

AUTOMOTIVE PRODUCTS

Gas, gasoline, Diesel engine cooling radiators • Heat exchangers • Intercoolers • Oil coolers • Supercharger intercoolers

OIL FIELD, HEAVY INDUSTRIAL, MUNICIPAL & CHEMICAL PROCESS COOLING EQUIPMENT

Engine jacket water coolers • Oil coolers • Steam and natural gas condensers • Natural gas coolers • Evaporative coolers and condensers • "VAD" Vertical air discharge cooling and condensing units

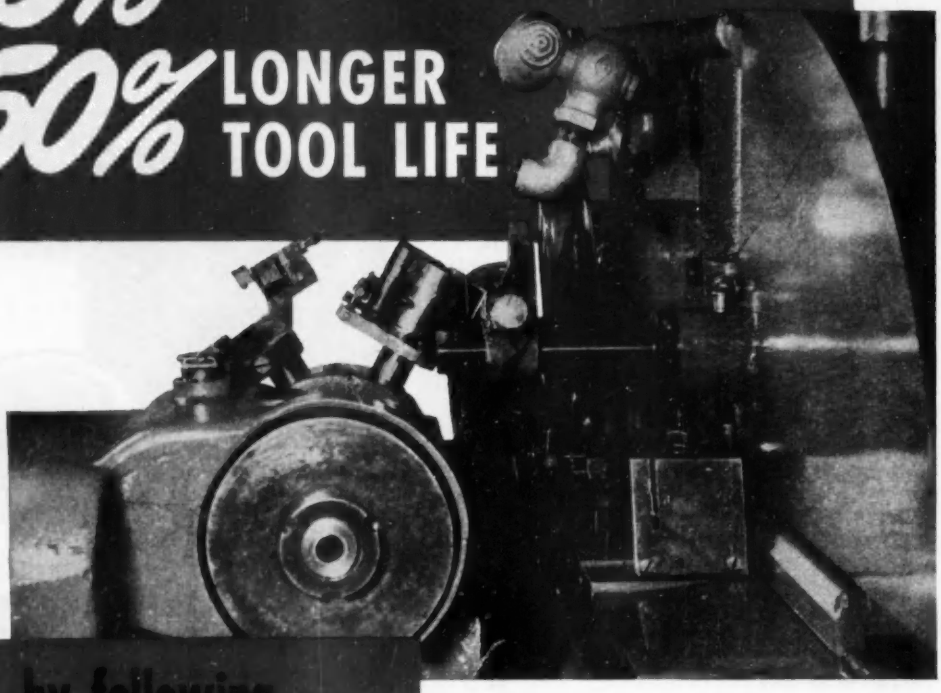
AERONAUTICAL PRODUCTS

Oil coolers • Supercharger intercoolers • Radiators • Heat exchangers • Valves • Regenerators

HEATING, COOLING AND AIR CONDITIONING PRODUCTS

Convectors • Unit heaters • Heating coils • Cooling coils • Air conditioning units • Evaporative condensers

15% MORE PRODUCTION
50% LONGER TOOL LIFE



...by following the Texaco Lubrication Engineer's recommendation

A California manufacturer* machining SAE 1018 steel on Brown & Sharpe automatics, was experiencing excessive tool failures and having difficulty in getting proper finish on parts. After a thorough study of the machining operations and the condition of the cutting tools, a Texaco Lubrication Engineer recommended *Texaco Transultex Cutting Oil* to overcome the trouble.

Results of following this recommendation have been: (1) desired finish obtained, (2) increase of about 50% in tool life, (3) 15% increase in production output due to a 15-second reduction in the machine time cycle.

Whatever machining you are doing, there is a Texaco Cutting, Grinding or Soluble Oil to do it more effectively. And a Texaco Lubrication Engineer, specializing in machining operations, will gladly help you select the right coolants to help you work your metal better, faster and at lower cost.

Get these benefits in *your* plant. Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, New York.

*Name on request

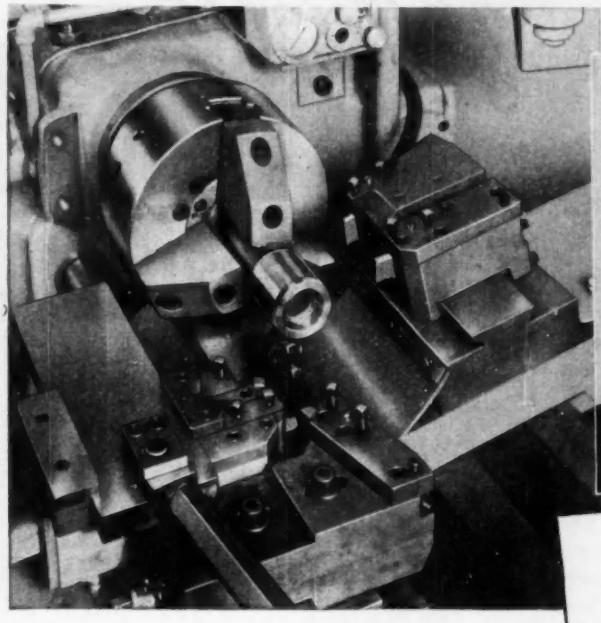
TEXACO

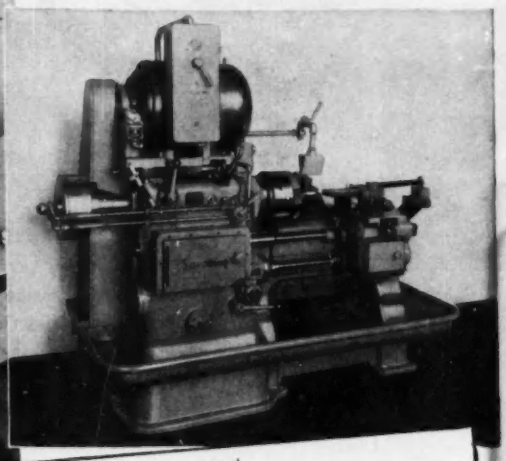
TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

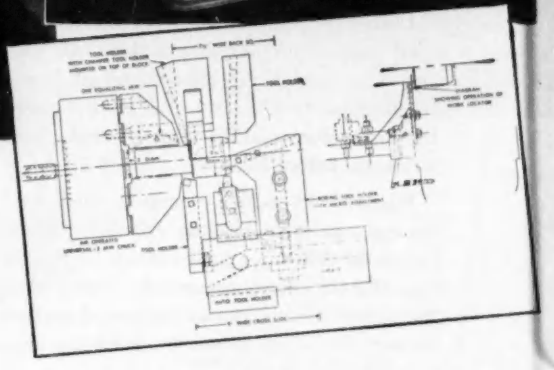
TUNE IN . . . TEXACO presents MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon.

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK







Lo-swing CUTS COSTS ON
CHUCK WORK

Problem: To turn and chamfer outside diameter, face both ends and bore inside diameter of Idler Shafts in a single automatic operation.

Solution: The Model LR Automatic Lo-swing Lathe selected for this job was equipped with a 10″ three-jaw, air-operated chuck having one jaw fitted with a swivel key to compensate for irregularities on the forged stem. The large diameter is turned and the bevel generated with two tools mounted on the front slide which also carries the adjustable boring tool holder and tool. Both ends are faced to length and the inside face chamfered with three tools mounted on the automatic back facing attachment. Line drawing shows work locator which is automatically shifted to locating position when machine stops and automatically relieves when machine is started. Operation is entirely automatic. Operator simply loads and unloads chuck and pushes starting lever. Machining time is 39 seconds, floor to floor.

Engineered jobs are our specialty. Our staff is at your disposal to assist in solving your problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

United Develops *Plastic* Oil Bath Air Cleaner

NEW!

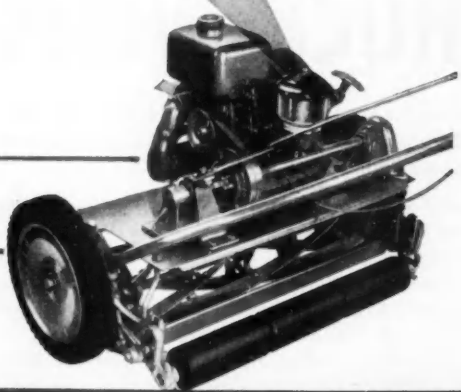
TRANSPARENT!

UNBREAKABLE!

Made of tough, durable plastic, this new transparent United Oil Bath Air Cleaner permits you to observe the cleaning action inside the unit. Developed by United Specialties Company, this attractive air cleaner is standard for 1950 Jacobsen Mowers powered by the popular Jacobsen 2-cycle engine.

United Oil Bath Air Cleaners are noted for their positive dirt-trapping action. Air processed through a highly efficient United cleaner is over 99 percent abrasive-free when it enters the carburetor, resulting in better engine performance, longer life.

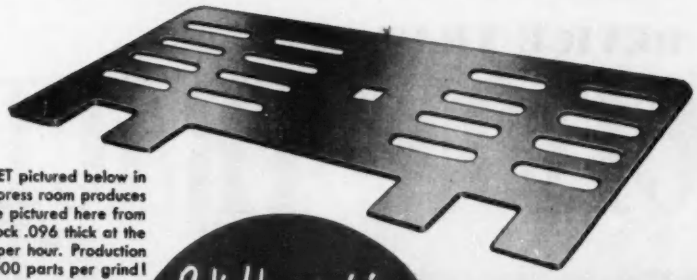
Whatever the engine — large or small, stationary or portable, gasoline or diesel — United has an air cleaner, or can build one, to fit any type of internal combustion unit. Today over 260 United models protect millions of engines in every kind of operation. Our sales engineers invite your inquiry.



Shown here is the Jacobsen Lawn Queen Power Mower equipped with United's new plastic oil bath air cleaner. This unit is standard on Jacobsen 1950 power mowers.

UNITED SPECIALTIES COMPANY
UNITED AIR CLEANER DIVISION, CHICAGO 28
MITCHELL DIVISION, PHILADELPHIA 36

★ AIR CLEANERS ★ METAL STAMPINGS ★ DOVETAILS ★
IGNITION AND TURN SIGNAL SWITCHES ★ ROLLED SHAPES

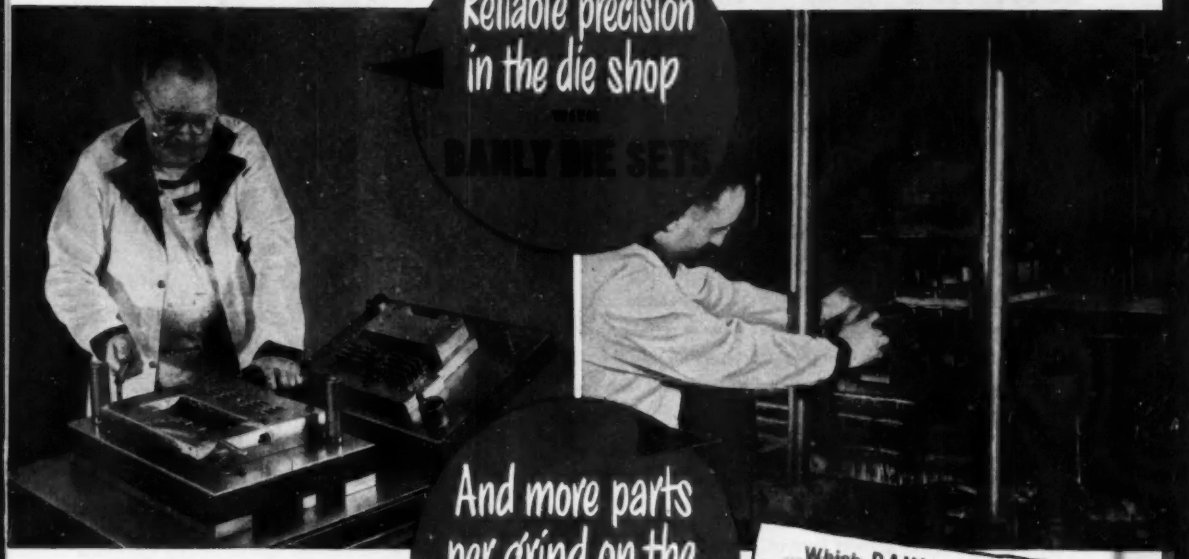


The DANLY DIE SET pictured below in the shop and in the press room produces the pressure plate pictured here from 1010 C.R.S. strip stock .096 thick at the rate of 600 pieces per hour. Production averages 100,000 parts per grind!

Reliable precision in the die shop

with

DANLY DIE SETS



And more parts per grind on the production line!

HERE'S WHY...

Hardened, ground and lapped pins make die assembly work quicker, easier and more accurate. Close guide post and bushing fits assure precise die relationship and longer die life. Danly Die Sets assure the lasting performance of your dies.

And they mean greater convenience, too! Whatever your needs, a Danly Die Set is quickly available. All standard sets are stocked in a nationwide system of Danly assembly branches!

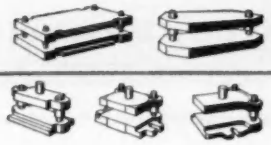
Which DANLY branch is closest to you?

- * Chicago 50, 2100 South 52nd Avenue
- * Cleveland 14, 1550 East 33rd Street
- * Dayton 2, 990 East Monument Avenue
- * Detroit 16, 1549 Temple Avenue
- * Grand Rapids, 113 Michigan Street, N.W.
- * Long Island City 1, 47-28 37th Street
- * Los Angeles 54, Ducommun Metals & Supply Co., 4890 South Alameda
- Milwaukee 2, 111 East Wisconsin Avenue
- Philadelphia 44, 18 West Chelten Avenue
- * Rochester 4, 16 Commercial Street

*Indicates complete stock

WRITE FOR THIS FREE BULLETIN

. . . and see how Danly's special die set machining service will mean important savings in your tool shop.



DANLY®

DANLY MACHINE SPECIALTIES, Inc.

2100 South 52nd Avenue, Chicago 50, Illinois

OVER 25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

THE DEVICE THAT PUTS ACTION IN TRACTION

DESIGNERS · ENGINEERS WELCOME
NoSPIN Differential!

NoSPIN Differentials STOP wheel spin . . . while vehicles operate on roads, streets, in sand, mud, snow or on ice, saving tires, chains, gas, oil, insurance and manpower.

NoSPIN Differentials—fully automatic—proved in the driving axles of commercial vehicles through years of peacetime and war service throughout the world.

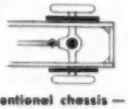
NOW—a new and silent type automatic-locking differential is available. Its exclusive two direction overrunning feature with instant positive drive when required, makes it ideally suited to transfer cases of multi-axle drive vehicles and for application to the driving axles of passenger cars and lightweight commercial vehicles.

NoSPIN Differentials will enhance the performance of the chassis you design. All modern automotive vehicles need ACTION in TRACTION.

Let our traction engineers furnish complete particulars.

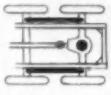
TYPICAL APPLICATIONS

1



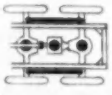
Conventional chassis — inter wheel.

2



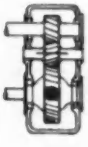
LOAD-BOOSTER third axle.

3



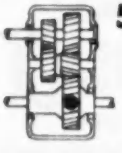
Transfer case and driving axles—full traction.

4



Two direction overrunning clutch — one outlet — forward drive.

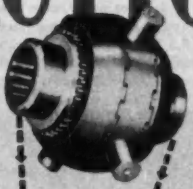
5



Two direction overrunning clutch—two outlets—four-wheel drive.

6

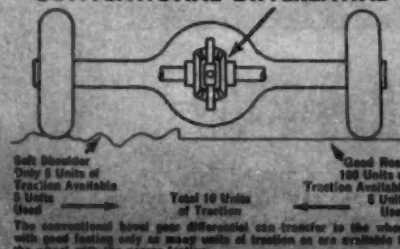
Through drive to Tube and Quill power outlets.



STOPS WHEEL SPIN

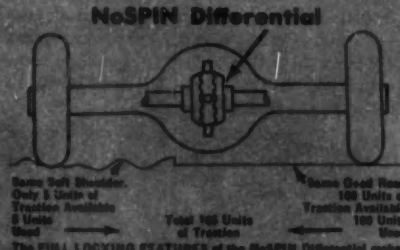
HOW TRACTION IS IMPROVED WITH NoSPIN Differential

CONVENTIONAL DIFFERENTIAL



The conventional bevel gear differential can transfer to the wheel with good footing only as many units of traction as are available to the wheel with the poorer footing.

NoSPIN Differential


Same Soft Shoulder.
Only 5 Units of Traction Available
5 Units Used
Total 105 Units of Traction
Same Good Road
100 Units of Traction Available
100 Units Used

The FULL LOCKING FEATURES of the NoSPIN Differential makes possible—for the first time—the combining of the total units of traction available to each wheel to propel the vehicle.

DETROIT AUTOMOTIVE PRODUCTS CORPORATION

8701 GRINNELL AVENUE • • • DETROIT 13, MICHIGAN, U. S. A.

Exide Men began where you left off, Mr. Diesel

No one knew better than you, Mr. Diesel, that when you gave your engine to the world it was but a beginning.

You must have foreseen that cranking would become increasingly difficult as more powerful engines were developed and their applications multiplied.

But those future cranking problems were for others to solve. Where you left off, Exide carried on.

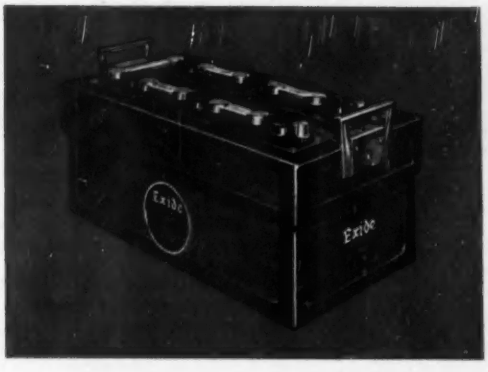
For many years Exide Men have worked closely with engine and starter manufacturers. Battery after battery has been designed and redesigned. Tests have followed tests . . . in laboratory and in service . . . under all operating conditions.

Today, builders and users of Diesel engines enjoy the benefits of those years of unceasing effort. For Exide provides batteries that are equal to any service demand.

When your Diesel cranking batteries are Exides, you can count on a quick breakaway and a high cranking speed.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 32
Exide Batteries of Canada, Limited, Toronto

EXIDE MEN — engineers, chemists, metallurgists, physicists, technicians — comprise the largest research staff of its kind in the industry.



"Exide" Reg. Trade-mark U. S. Pat. Off.

1888 . . . DEPENDABLE BATTERIES FOR 62 YEARS . . . 1950

Does your cutting oil give results like these?

$351.60 saved in coolant alone— in 40 days . . . and better machining!

This farm implement parts manufacturer formerly used a straight cutting oil in an automatic (49c per gal.) and a regular lubricating oil in the reservoir.

Now he uses ANTISEP ALL-PURPOSE BASE, (1-15 with water), both as a coolant *and* lubricant. No rusting or bearing wear, no skin trouble, no parts too hot to handle.

And real money saved—$351.60 in 40 days on one machine, plus the saving in lubricating oil. Nine months' run has proved the practical value of this change.

Production upped 15% . . . and tool life increased 50%!

The above threaded screws are brighter; tool life has increased 50% on chasers, 100% on forming tools; speeds increased to enable 15% greater production.

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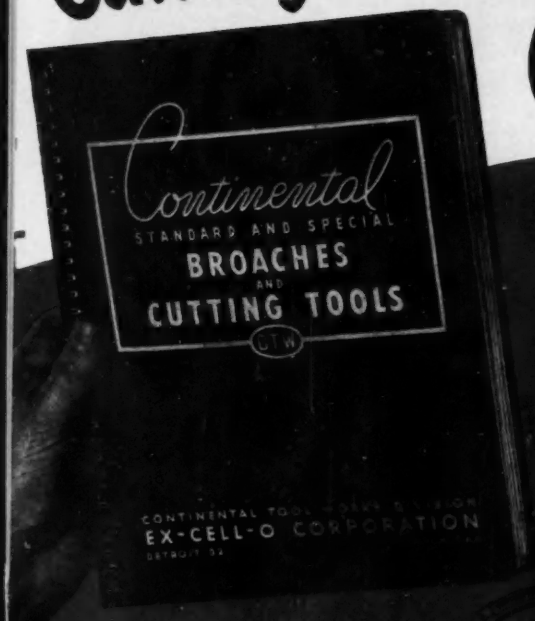

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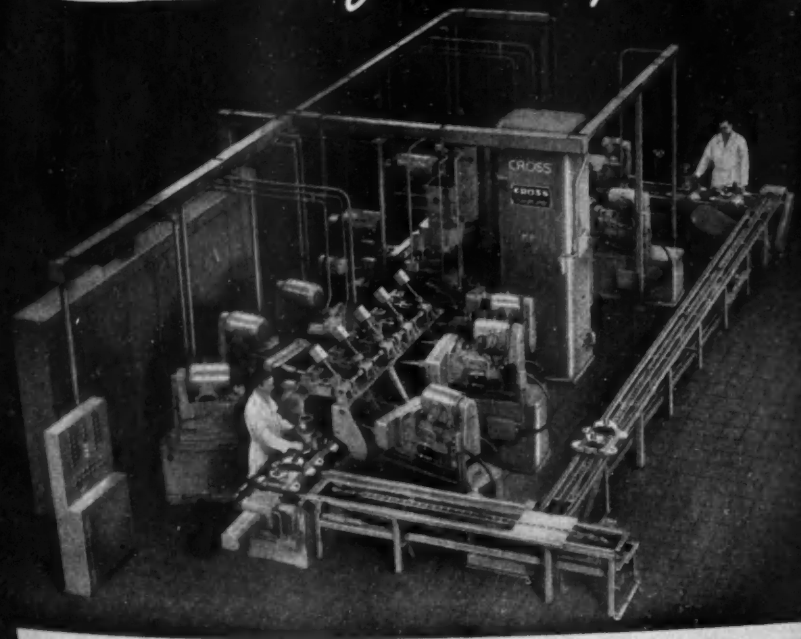

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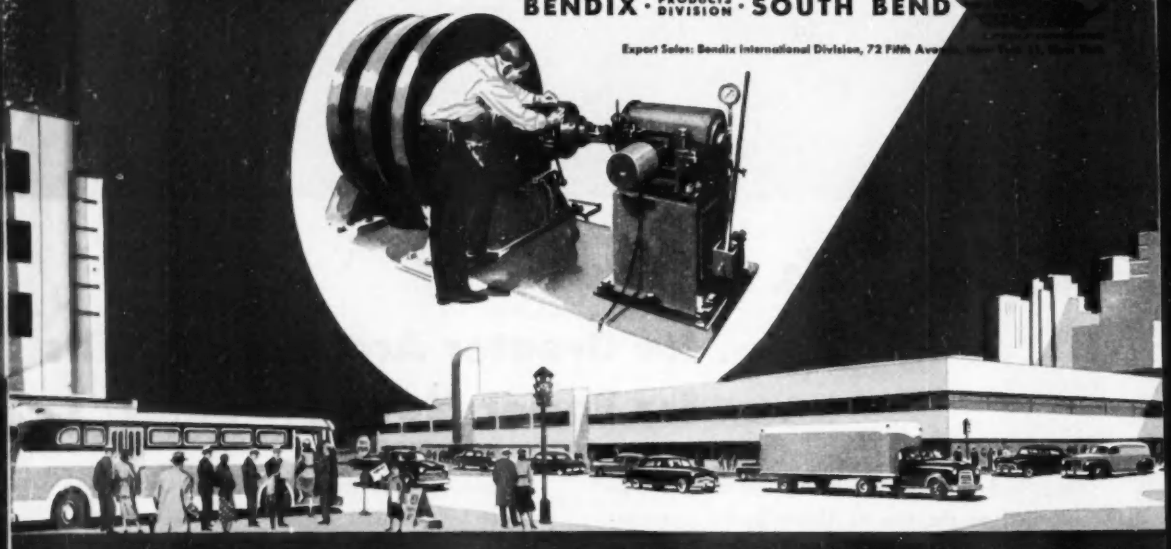

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AUTOMOTIVE INDUSTRIES
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High Spots of This Issue

★ Packard Ultramatic Transmission in Production—Part One

This is first of three articles presenting some of the most important manufacturing processes employed in producing Packard's Ultramatic Transmission. Described in Part One is the machining of three major castings—the case, bell housing, and clutch housing, starting page 30.

★ Dodge Truck 154 H.P. Twin Carburetor Engine

With introduction of the Model Y truck having a nominal rating of four tons, Dodge Division of Chrysler Corp. rounds out its coverage of the heavy duty transportation field. In this account are described the many features of the new truck, notably the twin carburetion induction system said to afford unusual economies. Page 34.

★ Sintered Metallic Friction Materials

The late war gave great impetus to use of sintered metallic friction materials in Ordnance. Since then their special properties have been seen to hold forth increasing possibilities to heavy equipment manufacturers and engineers. This article elaborates on the many automotive applications of the materials. Page 36.

★ Trend in Europe to Torsion Bar Suspension

Adoption of torsion bar suspension in passenger car development has shown a definite trend in Europe. This first of two fact-packed articles in a special series deals with the manufacturers using this type of springing. It also amply illustrates and clarifies typical designs on seven makes of European passenger cars. See page 38.

★ SAE's Largest Meeting

More than 3600 engineers and allied specialists registered at the meetings of the 45th annual convention of the Society of Automotive Engineers, held in Detroit, January 9 to 13. Important extracts from a number of the technical papers presented there are here published, along with a concise review of proceedings. Page 48.

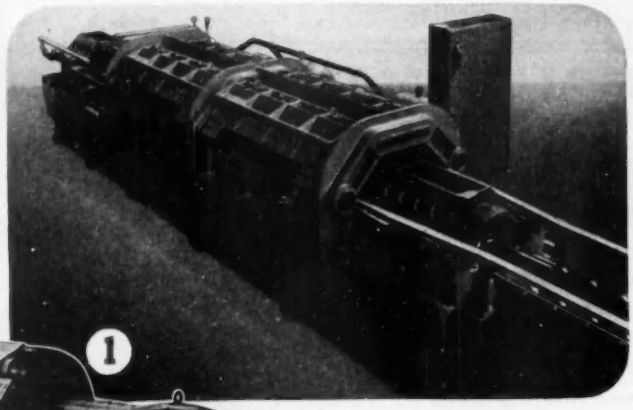
★ 22 New Product Items And Other High Spots, Such As:

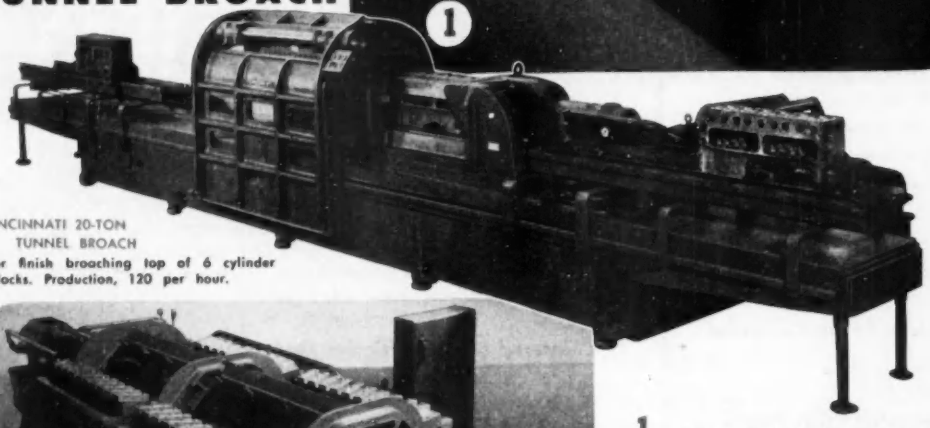
High versus low octane gasolines for high compression engines; new developments at the National Boat Show; and air conditioning of automotive vehicles.

News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3

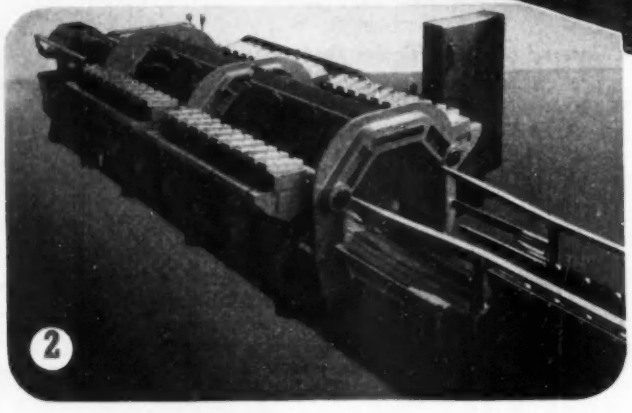
UP TO 140 QUICK SHAVES PER HOUR

FOR CYLINDER HEAD FACES WITH CINCINNATI TUNNEL BROACH





CINCINNATI 20-TON TUNNEL BROACH for finish broaching top of 6 cylinder blocks. Production, 120 per hour.



1 CINCINNATI 10-ton Tunnel Broach. It broaches two faces of V-8 cylinder blocks, at the rate of 71 blocks per hour, removing .032" max. stock each face.

2 Broach holders are hinged to facilitate removal of inserts when necessary to sharpen them.

A light skim cut on the faces of cylinder blocks, just before assembly, does wonders in conditioning them for other parts which have been so meticulously prepared. CINCINNATI Tunnel Broaches handle operations of this type at the lowest unit cost. ¶ Basically a simple, efficient machine, Tunnel Broaches are integrated with waist-high conveyors on the entrance and exit ends. The ram is hydraulically actuated. It carries the fixture which holds the work, pushing it under the bank of broach inserts (cutters). A wire cable pulls the finished part onto the exit conveyor as the fixture returns to the loading position, thus making use of the idle time. ¶ This is but one of the many examples of Cincinnati ingenuity in low cost broaching. Perhaps our Application Engineers can point out better, lower cost surface finishing methods for your shop. It costs nothing to inquire. Write to Department E.S.

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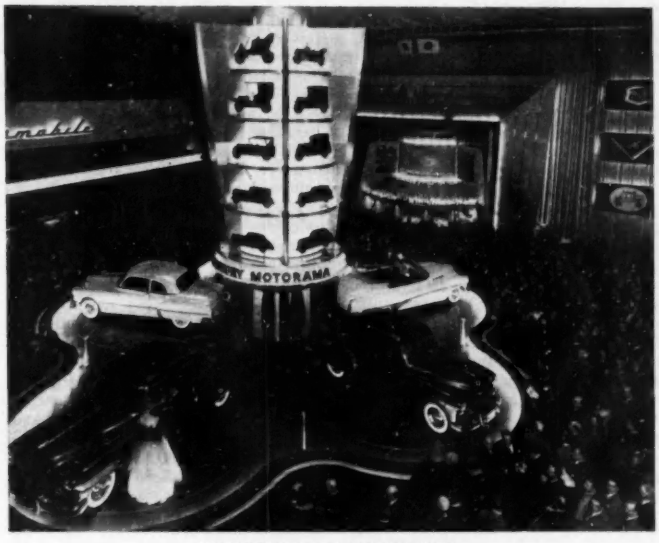
News of the AUTOMOTIVE INDUSTRIES

Vol. 102, No. 3 February 1, 1950

Dodge and Ford Cut Truck Prices

Recent price cuts by Dodge on trucks ranging from $40 to $125 were the opening gun in a sales battle that was followed by reductions ranging from $20 to $80 in the list prices of Ford trucks and a cut of $148 in the list price of the Ford V-8 station wagon and the Mercury station wagon. Coincidentally Ford has announced the addition of a six-cyl station wagon in the Ford line with a list price of $1895.

Chevrolet has declined to comment, but a good guess is that it will meet the cuts with some of its own if competition dictates, at least on certain models.



MIDCENTURY MOTORAMA

The main exhibit of GM's 1950 MidCentury Motorama, which was held in New York City from Jan. 19 to 27, shows the 30-ft Pillar of Progress extending almost to the ceiling with plaster reliefs of automobiles going back to 1900, together with representative 1950 GM models.

GM Holds Motorama in NYC from Jan. 19-27

Holding its 1950 MidCentury Motorama extravaganza in New York City from Jan. 19 to 27, GM showed 38 of its 1950 models, including Cadillac's new 1950 models for the first time, together with displays of Fisher Body, Chevrolet Truck, GMC Truck, Allison, Aeroproducts and other GM divisions in over 25,000 sq ft of space in six major show areas. Cadillac, Buick, Oldsmobile, Pontiac and Chevrolet were represented on the central stage (see cut on this page) and in five separate exhibition rooms. Two features with live models and actors participating were presented during the show. One, Motors and Melodies, presented on a revolving stage, was a review of America on wheels through the first half of the century. Scenes depicted touched on important periods in America from 1900 to 1950, with emphasis on the role the automobile has played in the development of the country. In period custumes actors and actresses portrayed in pantomime the periods covered, with a background of appropriate music and narrative. The other feature, MidCentury Modes, was staged against the Pillar of Progress and showed advances in car design and engineering from the start of the century to the present. The models posed with examples of the five GM car lines, displayed by a moving mechanism of turntables. A third section of the revolving stage depicted a series of dioramas related to the automobile industry when the live shows were not on. The newly announced Allison T40 turbo-prop aircraft engine developed for the U. S. Navy, was shown to the public for the first time, together with Aeroproducts' new contra-rotating propeller.

Cadillac Cuts Prices $30 to $211

Ranging from $30 on the series 62 coupe to $211 on the series 60 special sedan, price cuts on all 1950 Cadillac models have been announced by Don E. Ahrens, Cadillac general sales manager. The price reductions include a $25 decrease in the price of the Hydra-Matic transmission which was made last November. Hydra-Matic transmission is standard equipment on all series 62 and 60 special models, and remains optional on series 61 and 75. For 1950, back-up lights and glare proof mirrors, optional on all models last year are standard equipment on all models this year, and the special steering wheel, optional in 1949 on series 61 and 62 sedans and coupes, is standard this year on all models.

Nash Hits All-Time High in 1949 Car Production

Final production figures for 1949 show that Nash hit a new all-time production high with 142,592 passenger cars. The previous record was set in 1928 when the company turned out more than 138,000 cars. H. C. Doss vice-president in charge of Nash sales, predicts that production and sales this year will exceed the 1949 record.

FTC To Hold Hearing on "Packing" Contracts

Automobile retailers will soon have an opportunity to air their views on proposed federal rules barring the "packing" of sales and installment contracts.

LINCOLN FOR FIFTY

With a new front grille and newly-styled front fenders, the new 1950 Lincoln Cosmopolitan six-passenger coupe, shown above, together with the other new 1950 Lincoln models, are powered by the 152-hp engine which is equipped with new three-ring pistons, a new five-bladed fan, and a new three-point wedge belt drive.

The Federal Trade Commission has scheduled a public hearing for Feb. 2 on proposed trade practice rules designed to prohibit what the FTC calls "fictitious amounts or overcharges" in connection with installment financing plans. Pro-and-con arguments in connection with the proposed rules were heard originally at a trade practice conference held in Washington on Sept. 15. The public hearing, which will be under the supervision of Lowell B. Mason, acting FTC chairman, will be held at 10 A.M. Feb. 2, at the Dept. of Commerce auditorium.

K-F to Have New Models Plus Hydra-Matic Drive

Kaiser-Frazer will show its new low-priced automobile to the public at the Chicago Automobile Show starting Feb. 18. At the same time K-F will introduce a completely new and enlarged line of Kaiser models and a restyled and more complete line of Frazers. The low-priced car will go into production in June, and will be offered in two-door standard and deluxe models with a choice of either a four or six-cyl Willys engine. The price will not be announced at the show, but according to Edgar F. Kaiser, president, it will be priced very favorably with the lowest of the Big Three. K-F has arranged for tooling at the Willys plant for production of 800 engines a day. The car is a two seater with a wide front seat holding three persons comfortably, and a fold-down rear seat accommodating two passengers. It is strictly functional in design with no excessive ornamentation or fancy trim, but overall styling is nonetheless good. There is no rear deck lid, but the luggage compartment is available from within the car. Further details and specifications will be available when the car is ready for the public.

The Kaiser line is completely new with striking styling and intensive design changes throughout the engine and chassis. For the first time K-F dealers will have a variety of models including four-door sedan, two-door sedan, two-door and four-door Traveler utility cars, business coupe and club coupe. The Frazer line has been restyled front and rear and in the interior and consists of four basic models, all of them four-door. They are—standard sedan, Vagabond utility, standard convertible and hard top convertible with or without Nylon fabric covering. Only the two convertibles are designated as the Manhattan this year with the Virginian name dropped out of line. Prices on the new 1951 lines will not be higher than on previous models and it is hoped that they may be lower, according to Mr. Kaiser. He also revealed that dealer discounts will be "competitive or better" this year. Previously they had been averaging about 21½ per cent compared to approximately 25 per cent for competitive dealers. Including the low price car, there will be 13 basic body styles and 21 when deluxe models are included. Production of the 1950 model run was suspended Jan. 25 for the changeover. By the middle of March, production will again be underway on the Frazer, and will get started shortly thereafter on the Kaiser.

Kaiser-Frazer will offer the GM Hydra-Matic transmission on its new Kaiser and Frazer lines to be announced about the middle of this month. The company is also working with Borg-Warner on adaptation of another type of automatic transmission to be offered on the lower priced K-F line which will make its appearance this summer. Only minor changes will be required in the K-F line to adapt Hydra-Matic, since the war was originally designed to take whatever type automatic transmission the company might select.

The company has spent more than $3 million reorganizing and improving its plant layout and equipment in preparation for the new models. Changes include rerouting of assembly lines for greater capacity and flexibility, installation of additional conveyers in the body assembly section, and complete redesigning of the sewing and upholstering balconies. Also, several new presses have been added to the stamping operation.

FIRST OF 4000

Delmar G. Roos, first vice-president, Willys-Overland Motors, is shown examining the engine of the company's new military Jeep. (see page 18, Jan. 1, AUTOMOTIVE INDUSTRIES). This vehicle is the forerunner of about 4000 new military Jeeps to be made on a $12 million contract by Willys.

INDUSTRIES

GM Style Chief Says Car Sizes at Maximum

Width, length and height of automobiles have about reached their maximum and currently the tendency is to reduce length by better space utilization without compacting the interior, according to Harley J. Earl, GM vice-president and head of the styling section. He said that continuing progress is being made in design, particularly in greater visibility, better treatment of exterior and interior trim, and in color and pigment uses.

Ford Buys Site for Parts Depot

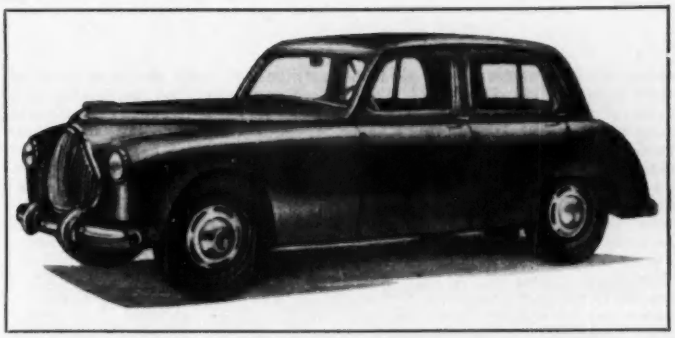
A 45-acre site in Detroit has been bought by Ford's Lincoln-Mercury Div., for the construction of a new parts depot. The plans call for the erection of a two-story office building in conjunction with a one-story warehouse, and it is expected that the structures will be ready for occupancy within nine months.

Commerce Department Sees Good Automotive Year

The current year will be a good one for the automotive industries, according to a Commerce Dept. analysis. A decline in production during the last half of the year is forecast. Pointing out that total factory sales of 6.2 million units last year was an all-time record, the study said that it is unlikely that "1949 production will be equaled in the next few years." Factory sales this year are expected to be "10 to 20 per cent below 1949." Truck and bus sales last year amounted to about 1.1 million, a drop of about 300,000 from 1948, and a further drop is expected this year. Replacements parts production in 1949 was about 21 per cent below the record $2.6 billion produced in 1948, and is expected to remain at about the same level this year. Emphasizing that the peak in parts demand has passed, the report attributes this to the fact that more than 20 million motor vehicles were produced in the period 1945-49 and, further to "the accelerated rate of scrappage of oid vehicles, especially trucks."

Rubber Weight 94-143 Pounds in 1950 Automobile

A recent study by Goodyear Tire & Rubber Co. engineers shows that the rubber content in 1950 model automobiles range from 94 to 143 pounds. While tires and tubes are normally thought to constitute the major rubber component of automobiles, the study shows that they actually account for only 24 to 43 pounds with other items ranging from 70 to 100 pounds. These other items include such parts as weatherstripping, floor mats, dust seals, control pedals, arm rests, engine mounts, seat cushion pads, fan belt, radiator and heater hose, battery boxes, windshield wipers, gaskets, and so forth. There are about 350 to 400 rubber parts in the modern car, according to the Goodyear engineers.



Courtesy of *The Autocar*, London, England

SPANISH VERSION

The latest version of the Eucort automobile, built in Spain, is shown above. Powered by a three-cyl water-cooled engine, which reportedly develops 32 bhp at 4570 rpm, it has an overall length of 13 ft, 3½ in. The car is available as either a sedan or station wagon.

Time Lost Through Strikes in 1949 Near Record

Just for the record, time lost from strikes last year was second only to the 1946 records. According to the Labor Dept. in Washington, about 53 million production days were lost by work stoppages last year, this figure being exceeded only by the 116 million days lost in 1946.

Complete Arbitration of Bell Aircraft Strike

In a 51-page report, the New York State Board of Inquiry virtually wrote finis to the 18-week strike at Bell Aircraft Corp., Buffalo, N. Y., which ended last Oct. 17. The board, which became an arbitration group at the strike's end, awarded a five-cent-an-hour "package" wage increase in a new one-year contract; denied completely the request of Local 501, United Automobile Workers (CIO), for a pension plan; and rejected union benefits. The board was in session approximately 15 days in all for hearings and study.

Packard Reduces Price of Ultramatic Drive

Packard has reduced the price of its Ultramatic drive automatic transmission from $225 to $185, a cut of $40 or 18 per cent. The action follows recent price cuts by GM divisions on Hydra-Matic and Dynaflow automatic drives of $25 and $40 respectively. Packard is scheduling about 70 per cent of its 1950 production to be equipped with the Ultramatic. It is standard equipment on Custom models and optional on other models. The output of the transmissions is currently on a two-shift basis.

Creditors Approve Plan to Revive Playboy

A plan for reviving the Playboy Motor Corp. received creditors' approval in Federal Court. Judge John Knight directed attorneys to prepare a formal order confirming the plan which calls for the manufacture of a small automobile marketable at approximately $800. Meanwhile, he permitted Trustee Allen H. Gardner to proceed with the auction sale of machinery and other physical assets at the Playboy plant. A group of Chinese engineers, associated with the Lytemobile Co. of New York, will attempt to put the small car plan into production. S. C. Hu, Lytemobile president and chief engineer, also has offices in New York. Dealers who advanced

money for Playboy franchises and then were unable to get cars to sell are in favor of the plan submitted, Attorney John E. Leech said. He said that a committee of three dealers was formed to represent all of the franchise holders who are located throughout the United States and in a number of foreign countries. The committee consists of Edwin Jackson, Great Neck, L. I.; Elmer Harlow, Battle Creek, Mich., and Wilmont Carruthers, Contacook, N. H. Other creditors, besides the franchise holders, have voted overwhelmingly for the plan, since it was proposed a month ago.

Federal Truck Gets $1 Million Loan from RFC

A loan of $1 million to the Federal Motor Truck Co. of Detroit has been approved by the RFC for the purpose of new tooling and providing working capital. Other recent approvals by this government agency include $1 million to H & B American Machinery Co. of South Attleboro, textile equipment manufacturers, and $550,000 to Diamond Full Fashion Hosiery Co., of High Point (N. C.) for new machinery and other purposes.

INCORPORATES TWO

Two improvements have been incorporated in Federal Motor Truck Co.'s Series 50 engine. Phil Sanford, assistant experimental engineer, is shown measuring performance characteristics stroboscopically. To lengthen exhaust valve life, rotators have been added to the engine. New interchangeable precision copper lead alloy bearings with an electrically coated inside of lead and tin have replaced the bronze-backed cadmium nickel bearings.

Lincoln Building Fleet of White House Cars

The Lincoln-Mercury Div., Ford Motor Co., is building a fleet of 10 Lincoln automobiles for use by the White House. Nine of the units are seven-passenger Cosmopolitan limousines, and the tenth is a seven-passenger convertible. One limousine and the convertible will carry special running boards for secret service men who guard the President. The cars are being assembled by a custom body builder under the supervision of Ford engineers. The limousines, on a 145-in. wheelbase, have a compartment for the driver separated from the passengers by a glass partition. Special fittings, including rear compartment radio, have been installed for the President. A Lincoln Cosmopolitan convertible was recently equipped with running boards by Ford for White House use.

British Hit Output Record in November

New records were reached in British automobile output during November with the production of 37,176 passenger cars and 20,017 trucks. The home market was allowed to retain 9313 passenger cars and 8848 trucks, leaving 27,863 cars and 11,169 commercial vehicles for export. The United States took nearly 1400 cars in November, the highest number since January 1949.

Hayes to Supply Parts to Packard

Packard has revealed that Hayes Mfg. Co. of Grand Rapids, Mich., has been signed as a supplier of hoods and fenders. The Hayes firm has begun die work for the items which will be used on 1951 model production. The company is also starting production on fenders and doors for Nash, reportedly for the small car due this spring.

New Ford Engine Plant Due Late Next Year

Confirmation of Ford's plans to build a new engine plant and foundry at Cleveland leads to the conclusion that the company will make no major engine changes before very late next year. The new Cleveland operation is not scheduled to get into operation until late 1951, and undoubtedly tooling for the new series of engines Ford has in the works will be done coincident with equipping the new unit. It is understood that the Ford Six and Mercury V-8 engines will be built at Cleveland with the Rouge plant in Detroit supplying Ford engines. It would appear unlikely that a new Ford V-8 engine could be tooled at the Rouge ahead of completion of the Cleveland operation because facilities will be required to produce power plants for Ford Sixes and the Mercury V-8. The new engines Ford will put in its line late next year are of the overhead-valve type.

1949 Coal & Steel Strikes Barred Labor Dispute Improvement

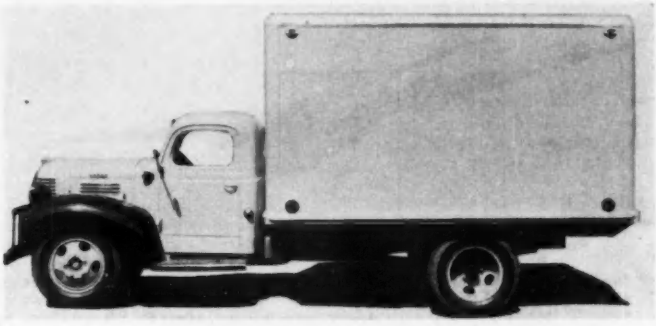
In reviewing the labor relations picture for 1949, two things stand out prominently. One is that had it not been for the coal and steel strikes, the labor dispute record would have shown a continued improvement, a trend which began with the amendment of the Wagner Act. The other is perhaps more important. It is that, if work idleness during 1949 is any indication of a pattern—and many believe that it is—then any strikes in the more immediate future will not be so much concerned with wage issues as so-called social benefits. These include demands for pensions, medical care, and fringe benefits.

Wage issues, particularly in 1946 when an all-time record was set for strikes and total strike-idleness, has been the key factor in the past. It is significant that in more than half the 1949 strike idleness, wages and hours were minor issues while the primary demands were for welfare concessions.

The Bureau of Labor Statistics, in a preliminary report for 1949, shows that aside from the steel and coal strikes, total strike idleness for the year amounted to about 27 million man-days compared with 34 million in 1948. The number of workers involved would have numbered roughly about 1,475,000 in contrast with 1,960,000 for 1948.

However, when the steel strike and the three separate "no-day work-week" stoppages in the coal fields are included, the number of workers involved during the year immediately jumps to 3.1 million and the lost days of work to 53 million. These overall figures have been exceeded only by those for 1946, an all-time peak, when 4.6 million workers lost a total of 116 million days of work through strikes.

Turning to other industries, the BLS report indicates that labor conditions within the automotive and its related fields were relatively stable throughout 1949. The chief exception was the 25-day Ford strike which involved some 62,000 workers and resulted in more than 1.5 million days of idleness. In addition to Ford, the BLS report records the six-day strike at Chrysler which involved 17,000 workers and which concerned neither wages nor welfare, and the one-day strike of 13,000 Hudson employees. In related industries, grievances centering around the company's truck drivers took out 29,000 Briggs workers for three days. The pension question also arose among Goodrich employees and resulted in a 35-day stoppage involving 15,000 workers in seven states.



ROUNDS OUT A LINE

Acquiring the assets of the Capitol Body Co., Indianapolis, Ind., the Mid West Body & Mfg. Div., Electrographic Corp., Paris, Ill., has entered the van body field. Rounding out their line of farm and stake truck bodies, the addition of an all-steel, all-welded van body has been announced by Mid West, and heavy-duty vans are to be offered in any length, width, height or size.

Sinclair to Market Transmission Fluid

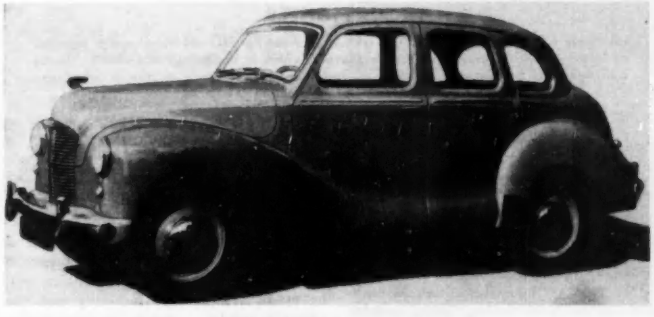
The Sinclair Refining Co. has joined the ranks of oil companies marketing Type A transmission fluid which is a universal type for all GM automatic transmissions and the Packard Ultramatic. It will also be satisfactory for use in the Mercury and Ford automatic transmissions when they are introduced.

Fisher Body Large Buyer of Basic Materials

GM's Fisher Body Div. has an interesting tabulation showing the amount of various materials it used to build more than two million automobile bodies last year. It includes 1,160,000 tons of steel or enough to build 14 ocean liners the size of the Queen Mary and measuring 1.5 billion sq ft in area equivalent to a steel curtain 26 ft high around the border and general coast line of the United States; 51 million sq ft of glass or enough to reglaze Radio City's 16,500 windows 100 times; 17 sq mi of upholstery fabrics — enough to blanket almost all of Manhattan Island; 78 million lb of cotton equivalent to eight dresses for every woman and girl in the United States; nine million sq ft of leather or enough to make a new pair of shoes for every man in Texas and Wisconsin; 150 million ft of copper wire — more than enough to stretch around the world at the equator; and 169,493,000 lineal ft of rubber weatherstripping, which would reach from New York to San Francisco and back six times.

Buick Leading Seller of Automatic Drives

Although Buick got into the production of automatic transmissions only two years ago, output and acceptance stepped up so rapidly that the division last year sold more cars equipped with fully automatic transmissions than any other automobile producer. Output of Dynaflow units in 1949 totaled more than 281,000 units, or four times as many as was produced in 1948. Production schedules call for continued peak output for this year. Buick's total production of cars last year was about 400,000, or approximately 82,000 more than the previous record year, 1941. More than 70 per cent of all Buicks sold last year were equipped with Dynaflow transmissions.

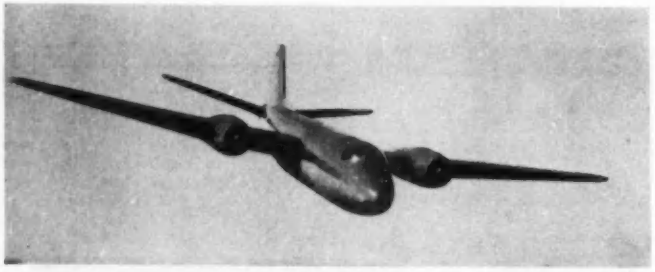


NO CHANGE IN CHARGE

With prices unchanged, the newly-announced 1950 British Austins have a higher gear ratio, and a larger, 17-in. steering wheel. All cars are now equipped with separately placed parking lights beneath the sealed-beam type headlights; new, heavier bumpers are used; a temperature gauge has been added; and doors are sealed with sponge rubber.

ECA Lists Machine Tools and Potential ERP Markets

The Economic Cooperation Administration's Office of Small Business has released a list of types of machine tools for which there are potential markets in Marshall Plan countries. The information is the first commodity analysis to be obtained, and is in line with ECA's efforts to provide American small business firms with useful data on sales possibilities abroad under the European



Acme

HIGH FLYER

Britain's first all-jet bomber, the medium-range Canberra, shown above, is now in quantity production. Although its speed is secret, this Rolls-Royce jet-engined plane is designed especially for high-speed, high-altitude flying, and is believed to be in the 600 mph class.

Recovery Program. As other commodity reviews become available they will be released. Types of machine tools listed are those presently manufactured only in the United States and for which there are no substitute equipment produced in Europe. When purchases are made, ECA pointed out, the orders will have to be placed with American suppliers.

Chevrolet Powerglide Price Includes Larger Engine

Chevrolet is emphasizing that the $158.50 extra price (including taxes) for its automatic transmission as optional equipment is actually for a package unit. The reason is that the price covers not only a Powerglide torque converter, but also includes a 105-hp engine, compared with 92-hp in conventional models, and a reduced rear axle ratio. The "Power Team" is available only on de luxe models. Prices of the 1950 models are unchanged from last year with the exception of a $250 cut on the all-steel station wagon. The new hard top convertible, called the Bel Air, is priced at $1640 list, which is $100 below the conventional convertible.

Hudson Names R. Barit Purchasing Agent

Robert Barit, son of A. E. Barit, president, Hudson Motor Car Co., has been named purchasing agent. He has been associated with Hudson for more than 10 years, the last two as head of the buying unit and specification unit in purchasing.

Ford Realigns Sales Organization

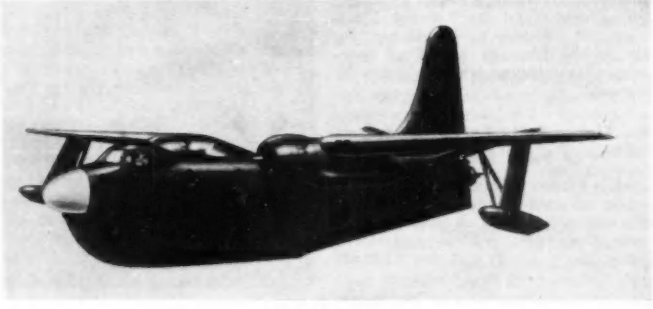
Two new top-level sales positions and the addition of two new departments have been announced by Walker A. Williams, sales manager of the Ford Div., Ford Motor Co. All of the departments under Mr. Williams and his assistant, L. W. Smead, have been regrouped under two heads: those dealing directly with sales activities and those dealing with services to the general sales staff. J. D. Ball has been named manager of product sales and service, heading up one group of departments, and F. J. McGinnis has been appointed manager of sales staff services to head the other group. A new car sales department has been created, and T. J. O'Neill has been named manager. It will be among those headed by Mr. Ball. In the group to be headed by Mr. McGinnis, a new department has been created with the appointment of William C. Scott as manager of the sales training department.

Cadillac Appoints Cole Works Manager

Edward N. Cole, previously chief engineer for Cadillac, has been promoted to works manager. He succeeds Clarence A. Raftrey, who died Dec. 20. Mr. Cole is succeeded as chief engineer by Charles F. Arnold, who had been his assistant.

Italian Car Firms to Make British Goblin Jets

Fiat, Alfa Romeo, Macchi, and S.I.A.T. Ambrosini are the Italian firms which will build British De Havilland Goblin jet engines under the arrangement whereby the Italian government has acquired a constructional license. The agreement also covers the construction under license of the De Havilland Vampire fighter. In addition to the existing day fighter, the Italians will also produce a fighter-bomber, a naval version of the Vampire, and a two-place, radar-equipped night fighter variant now undergoing flight tests.



SUB FIGHTER

The Navy has awarded an initial production contract for this new rough-water seaplane designed primarily for anti-submarine warfare, which is designated the P5M-1. To be constructed by the Glenn L. Martin Co., Baltimore, Md., it carries a crew of seven, and will be powered by two Wright 3350 engines.

Census to Collect Data on Selected Equipment

Beginning this year, the Census Bureau is preparing to collect production, shipment, and order data on a selected list of industrial equipment on an annual basis. This information will be made available to industry and the general public. Items on which the data are to be assembled include machine tools, tractors and selected farm equipment, castings, forgings, cast iron products, and truck-trailers.

Bendix Hits Peacetime Sales Record

Attaining a peacetime peak, sales of Bendix Aviation Corp. for the fiscal year ended Sept. 30, 1949, totaled $182,674,462, an increase of 12.4 per cent over $162,495,665 in fiscal 1948. Net income amounted to $11,086,781, compared with $11,280,742, for 1948, Sales of automotive products in 1949 equaled 31 per cent of total volume, compared with 38 per cent in 1948, while aircraft equipment was 47 per cent of the total compared with 42 per cent the preceding year.

U. S. Plane Purchases to Total $5.3 Billion from 1951 on

Under the President's current budget recommendations, about $5.3 billion will be expended for aircraft in 1951 and subsequently. The budget recommends new contracts in 1951 to the extent of $2 billion plus about $3.3 billion in authorizations already contracted for which will be carried into 1951. These plans would call for delivery of 2300 planes in 1951 and 3100 in 1952 or shortly thereafter. Some 2800 planes are to be completed and delivered this fiscal year.

Packard Appoints Graves Engineering Chief

William H. Graves has been appointed vice-president of engineering of the Packard Motor Car Co. He succeeds Col. J. G. Vincent who was made executive vice-president last Dec. 28. Mr. Graves has been administrative head of the engineering division since last April with the title of vice-president and director of engineering.

Form Vapor Power Corp. to Make Engines

The Vapor Power Corp. has been organized in Columbus, O., to take over the designs and patents of E. B. Neil on small vapor power plants using steam and other vapors for lawn mowers, garden tractors, and outboard motors. The company has started producing sample units up to 10 hp.

Warner Named to Direct Oldsmobile Publicity

Edward L. Warner, Jr., has been appointed publicity director of GM's Oldsmobile Div. He was formerly engaged in public relations and advertising with the Detroit office of McCann-Erickson, Inc. From 1940 to 1944 he was news editor in Detroit for AUTOMOTIVE INDUSTRIES and other Chilton automotive publications.

Goodyear Co. Chairman Predicts Rubber Roads

Thousands of miles of rubber-surfaced highways will be laid in this country within the next ten years, according to P. W. Litchfield, board chairman of Goodyear Tire & Rubber Co. He points out that a section of rubber highway installed on a heavily traveled street in Akron 25 years ago still shows little or no deterioration. He adds that similar roads laid in Holland before the war and subject to heavy pounding by war vehicles are in excellent condition. Other advantages are that a rubber asphalt mixture seals out water, protecting foundation from seepage, maintenance costs are lower, and traffic tie-ups because of road repairs are minimized, since only a few hours is required for the material to set after being applied.

Chevrolet Smashes Sales Record in 1949

For the first time, Chevrolet passenger car retail sales topped the million mark in 1949. The combined total of 1,391,654 passenger cars and trucks was 19 per cent better than Chevrolet's best previous year. In 1936, the former peak year, Chevrolet dealers delivered 1,168,863 units. Truck sales set a new all-time high for the industry reaching 350,728 units.

Electric Auto-Lite Cuts Prices of Batteries

The Electric Auto-Lite Co. has reduced prices on automotive storage batteries an average of about 7.5 per cent. It is the second reduction on batteries in eight months and was effective Jan. 10. The major reason for the price cut, according to Royce G. Martin, president, is the reduction in the price of lead. He said, however, that modern facilities for production in its plants have also achieved manufacturing economies which are reflected in the prices.

Lockheed Delivers First F-94A to USAF

The first production F-94A, initial plane of an order for 110 of the Lockheed two-place all-weather fighters, has been delivered to the U. S. Air Force. The outstanding difference between the F-94 and the F-80 is the extended nose and rounded radome housing the F-94's radar equipment. The F-94 is also equipped with an afterburner which is used to boost the power of the Allison J-33 jet engine.

Crash Pads Sought in N. Y. Measure

It was bound to come sooner or later. A bill will be introduced in the New York legislature requiring that safety crash pads be installed on dashboards of automobiles sold in that state after Jan. 1, 1952.

Acme

TAIL FORMS A T

Powered by three General Electric J-47 jet engines, the new Martin XB-51 ground support plane, with swept back wings, has an unusual tail assembly which features the horizontal stabilizer atop the vertical stabilizer.

News of the AUTOMOTIVE INDUSTRIES

Acme

FIGHTING FIRST

This new 16-ton Canadian jet fighter plane, the Avro CF 100, is powered by two Rolls-Royce Avon engines. With a reported speed of over 600 mph, this plane is reportedly the most powerful fighter in the world, the first long range, all-weather fighter of its type, and the first front line fighter to be designed in Canada.

Ford Sells 1800 Trucks to Post Office

The Ford Motor Co. has concluded a purchase agreement with the United States Post Office for 1800 trucks to be used in delivery service throughout the country. The trucks are the F-3 series and are equipped with six-cyl Ford truck engine and a special post office body. The first units will be delivered to the government about March 1.

Name Kindelberger Head of Air Science Institute

J. H. Kindelberger, chairman of the board, North American Aviation, Inc., has been elected president of the Institute of the Aeronautical Sciences.

Army Awards Contracts Totaling $900,000

Contracts for spare parts totaling more than $743,000 have been awarded by the Army to GMC Truck & Coach Div. of General Motors. Another for purchase of about $184,000 worth of parts for combat vehicles has been approved for the Wayne Foundry Stamping Co., of Detroit.

GM Replacement Parts Dies Stored Many Years

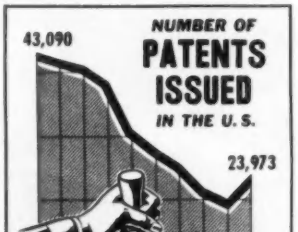
Assuring buyers of GM automobiles that they will be able to get parts as long as the car lasts is a definite element of expense to the company. During the model run at least five per cent of production is run off for replacement purposes, and the dies are then stored for possible use later. GM still has some 1930 and 1931 dies in storage which will not be junked until demand for parts they can produce no longer exists.

McCord Names Fields Works Manager

Dean S. Fields, formerly works manager for the McCord Corp., has been named vice-president in charge of manufacturing for all the company's seven plants. Before joining McCord several years ago, he was with Graham-Paige Motor Car Co.

Ford Moving Operations to New Monroe Plant

Ford is moving its manufacturing operations from its Flat Rock, Mich., plant to the new plant recently acquired at Monroe, Mich. It is the first of several small operations that will be moved into the new plant as space becomes available from Kelsey-Hayes, the former owner, which is liquidating its operations there.



Chevrolet Powerglide and Larger Engine

Clarification is made of a statement appearing in "High Spots" for the Jan. 1 issue of AUTOMOTIVE INDUSTRIES, page 15, starred item No. 2. In presenting Powerglide for passenger cars Chevrolet becomes first in the low-price motor car field to offer a torque converter type automatic transmission as optional equipment. It is *only in combination with* this option of Powerglide that a larger 105 hp engine is supplied—on any Deluxe model.

Cummins Enters Diesel Car in Indianapolis Race

The Cummins Engine Co., Inc., has entered a rear-drive, six-cyl, four-stroke, supercharged Diesel car, called the Cummins Diesel Special, in the Indianapolis Race. The car is powered by a new type Diesel engine with a piston displacement of 401 cu in., and a top speed of 4000 rpm.

Ford Announces 1950 Truck Line

Offering over 175 models, the new 1950 Ford trucks, recently announced, are powered by the 226 cu in., 95-hp, six cyl Ford truck engine; the 239 cu in., 100-hp V-8; the 337 cu in., 145-hp V-8; and a recently developed 254 cu in., 110-hp six. GVW ratings for the 1950 line range from 4700 lb in the F-1 to 22,000 lb in the F-8 straight truck and 39,000 lb when used with tractor and trailer.

Plastic Trim Material Shown at N. Y. Show

Visitors to the General Motors Show in New York City in January may have had a preview of a new interior trim material. It is a molded plastic which is used on door panels, rear or front seats, seat side panels and door scuff pads. Some models in the exhibit were equipped with the plastic trim which is still experimental and not yet available on any standard production models.

Belfie Succeeds Miller in Buick Sales Post

A. H. Belfie has been appointed Buick's assistant general sales manager for the Eastern Region to succeed H. J. C. Miller when he retires March 1. He will be succeeded in his present post of assistant general sales manager at the Buick central office in Flint by Robert E. Rudd, director of merchandising.

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers.

Cadillac Motor Car Div., General Motors Corp.—The appointment of **Edward N. Cole** as Works Manager of the Division has been announced, and **Charles F. Arnold** has been named Chief Engineer. Mr. Cole succeeds the late **Clarence A. Raftrey.**

Buick Motor Div., General Motors Corp.—**Robert E. Rudd** has been appointed Asst. General Sales Manager and **John H. Scudder,** formerly Sales Promotion Director, is now Director of Merchandising, succeeding Mr. Rudd.

Ford Div., Ford Motor Co.—The appointments of **A. E. Conn** as General Purchasing Agent and **M. W. Welty** as Industrial Relations Manager, have been announced. **Karlton W. Pierce** succeeds Mr. Welty as Manager of Industrial Relations of the Planning and Analysis Dept.

Hudson Motor Car Co.—**Robert Barit** has been named Purchasing Agent for the company.

Packard Motor Car Co.—**Hugh J. Ferry** has been elected President. The Packard directors also elected **Colonel J. G. Vincent** as Executive Vice President, succeeding Mr. Ferry in that post. Announcement has also been made of the appointment of **William H. Graves** as Vice President of engineering.

Consolidated Vultee Aircraft Corp.—**K. F. Leaman** has been appointed Asst. Div. Manager of the company's San Diego Div.

The Glenn L. Martin Co.—**Richard L. Johnson** has joined the company as Asst. to the President, **C. C. Pearson.**

Link Aviation, Inc.—**John P. Poth** has resigned as engineering manager.

Fairchild Engine and Airplane Corp.—Announcement has been made of the appointment of **Lawrence B. Richardson** as Director of Research. **Robert W. Kellhofer** has been named manager of the sales and service department of the Aircraft Div.

Niles-Bement-Pond Co.—**William P. Kirk,** Vice Pres. and Sales Manager, Machine Tools, has retired from active participation in the sales program, but continues to serve in the capacity of Consulting Engineer. **Alexander H. d'Arcambal** has been named General Sales Manager. Reporting directly to Mr. d'Arcambal will be the following: **J. D. Allan,** Mgr., Pratt & Whitney Domestic Machinery Sales; **J. C. Molinar,** Mgr., Pratt & Whitney Domestic Small Tools & Gage Sales; **H. Reichert,** Mgr., Pratt & Whitney Foreign Sales; **R. M. Johnson,** Mgr., Chandler-Evans Sales; **J. Potter Cunningham,** Vice President Manager, Potter & Johnston Co. and **V. L. Howe,** Acting Manager, Advertising.

Norton Co.—**John Jepson,** Asst. Secretary and a Director of the company, has been appointed Works Manager of the Abrasive Division.

Pratt & Whitney Aircraft Div., United Aircraft Corp.—**Perry W. Pratt** has been appointed Asst. Chief Engineer.

Delco-Remy Div., General Motors Corp.—**H. D. Dawson** has been named General Manager of the Division, succeeding **O. V. Badgley,** who has retired.

General Electric Co.—**J. Russell Watt** has been appointed Sales Manager of industrial laminates and insulating materials for the Chemical Dept.

Bendix Aviation Corp.—The election of **George E. Stoll,** of South Bend, Indiana, and **C. S. Harding Mott,** of Flint, Michigan, to the Board of Directors, has been announced.

Stewart-Warner Corp. — **David C. Peterson** has been named director of engineering and manufacturing of Division One. Distributor and national account sales activities of factory field men of the Alemite Div. of the Corporation, are now directed by **Huntington Eldridge.**

Thermoid Co. — **Donald A. Fruland** has been elected to the position of Asst. Treasurer. **Emil J. Houser** has been appointed Asst. Purchasing Agent.

Worthington Pump & Machinery Corp.—The appointment of **Harry E. Lewis** as Asst. Comptroller was announced. Mr. Lewis succeeds **Jos. A. Schallenberg,** deceased.

Williard Storage Battery Co.—**Clarence H. Endress** has been appointed Chief Engineer for the company.

Dana Corp.—The appointment of **R. B. Haynes** to the newly created position of Vice President in Charge of Manufacturing of the various Dana divisions, has been announced.

The Palnut Co.—**E. L. Johnson** has been appointed Sales Manager.

Ethyl Corp—The election of **Sanford M. Wagner** as Vice-President in Charge of Sales has been announced.

(Turn to page 68, please)

CALENDAR

OF COMING SHOWS AND MEETINGS

Conventions and Meetings

Nat'l Auto. Dealers Assoc., Atlantic City ..... Feb. 5-8
Nat'l Auto. Access. Mfrs. Assoc. Annual Expos., New York City.. Feb. 6-10
Automotive Electric Assoc., Conference, Chicago ..... Feb. 10-17
Pacific Automotive Show, San Francisco ..... Feb. 16-19
Chicago Auto Show, Chicago..... Feb. 18-26
ASTM Spring Mtg., Pittsburgh ..... Feb. 27-Mar. 3
Amer. Road Builder's Assoc., Cincinnati ..... Mar. 6-9
SAE Passenger Car, Body & Production Mtg., Detroit..... Mar. 14-16
Geneva Motor Show, Geneva, Switzerland ..... Mar. 16-26
Southwest Automotive Show, San Antonio, Texas ..... Mar. 23-26
Nat'l Production Expos., Chicago.. Apr. 4-8
Amer. Inst. Elec. Engrs. Conf. on Elec. Welding, Detroit ..... Apr. 5-7
Midwest Power Conference, Chicago ..... Apr. 5-7
Amer. Society Lubrication Engineers Convention, Detroit ..... Apr. 10-11-12
Amer. Soc. Tool Engineers Industrial Expos., Phila. ..... Apr. 10-14
Society of Motor Mfrs. & Traders British Auto. & Motorcycle Show, New York City ..... Apr. 15-23
SAE Aeronautic & Aircraft Eng. Display, New York City..... Apr. 17-19
Metal Powder Assoc. Annual Metal Powder Show, Detroit..... Apr. 25-26
3rd Highway Transportation Congress, Washington ..... Apr. 26-27
International Motor Show, Turin, Italy ..... May 4-14
Mid West Automotive Show, Chicago ..... May 11-14
Automotive Engine Rebuilders Assoc. Annual Convention, St. Louis. May 18-19
International Trade Fair, Toronto ..... May 29-June 9
SAE Summer Mtg., French Lick.. June 4-9
Amer. Electroplaters' Soc. Convention, Boston ..... June 12-16
A.S.T.M. Annual Mtg., Atlantic City ..... June 26-30
International Trade Fair, Chicago. Aug. 7-19
SAE Nat'l West Coast Mtg., Los Angeles ..... Aug. 14-16
SAE Tractor Mtg., Milwaukee..... Sept. 11
Instrument Soc. of Amer. Conf. & Exhibit, Buffalo ..... Sept. 18-22
SAE Nat'l Transportation Mtg., New York City ..... Oct. 16-18

Necrology

David J. Rohrer, 76, vice-president and a director, Four Wheel Drive Auto Co., died on Jan. 9, at Clintonville, Wisc.

Carl F. Uhlmann, 66, assistant general sales manager, GMC Truck & Coach Div., died Jan. 15 in Sarasota, Fla.

EATON TAPPETS—
for Maximum Performance and Service Life

It has been Eaton's privilege to work in close cooperation with vehicle and engine manufacturers not only in the production of tappets, hydraulic valve lifters, valves, and other precision engine parts, but also in the design and development of parts which have contributed to improved performance and longer life for internal combustion engines in every field of service.

EATON

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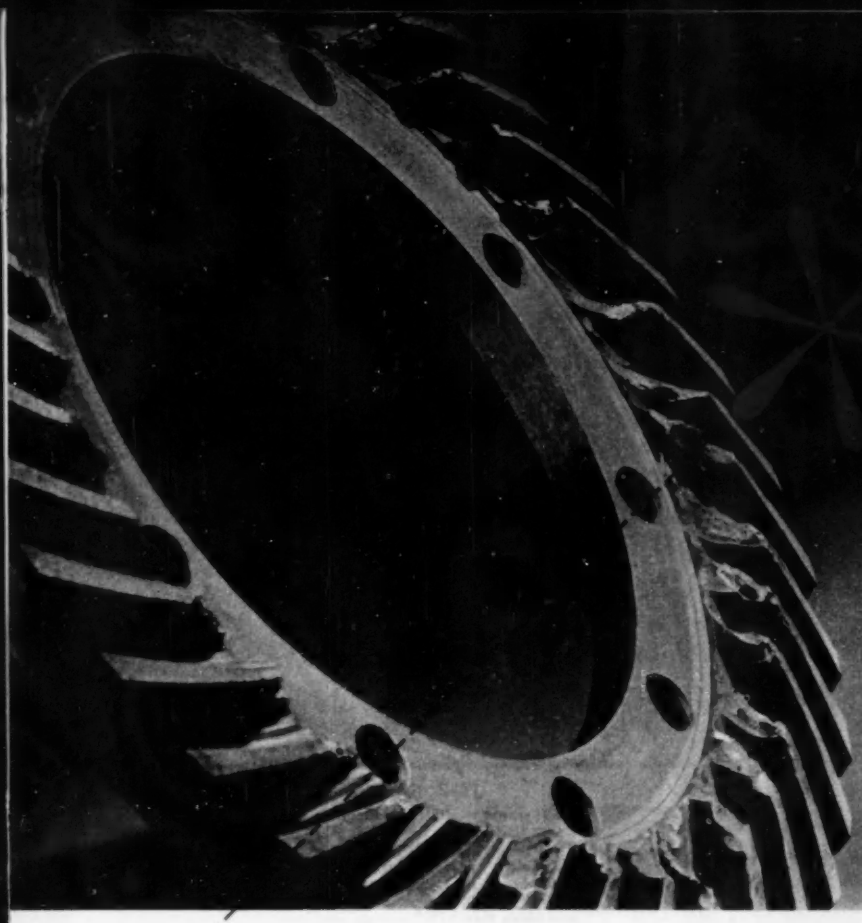

The Inside Story of a Pinched Penny

THERE is no economy in a cheap gear. On the contrary, a pinched penny may purchase untold expense—plus headaches without number.

That is why we specialize in gears—"Double Diamonds"—that possess *true* economy. Economy expressed in terms of lowest *final cost*—including installation *and* performance.

It takes a little more time to make "Double Diamonds"—and considerably more experience, care and skill. But when they're done, we're proud of them. And because they contribute so substantially to the life, the performance, and the continued efficiency of your product, you'll be proud of them, too.

Manufacturers interested in gears that are built to show lowest final cost—who have an eye for long-run economy—are requested to write for information.

DOUBLE DIAMOND TRADE MARK GEARS

Made by

Automotive Gear Works, Inc.

RICHMOND, INDIANA

• • • • • FOR AUTOMOTIVE FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS • • • • •

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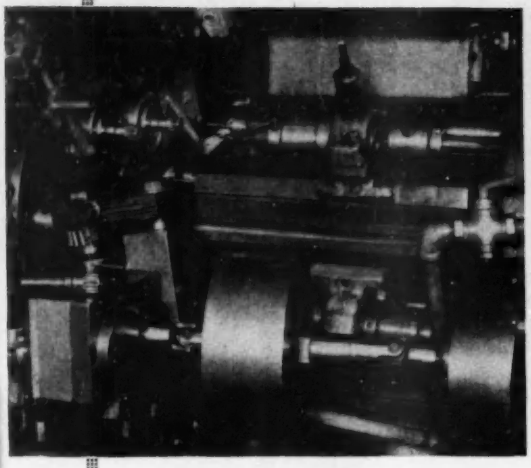
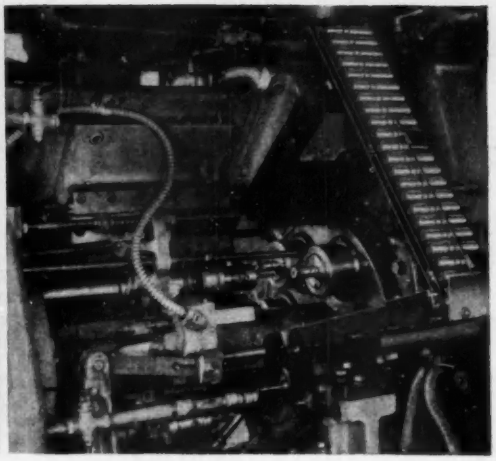
HOW TO SAVE ON SECOND OPERATION JOBS



Front tooling zone, Acme-Gridley bar automatic with special hobbing attachment for machining ratchet shafts.



Rear tooling zone, Acme-Gridley bar automatic with special magazine loader used in machining ratchet shafts.

JOB FACTS

Part—Ratchet Shaft $1\frac{5}{16}$" diameter x $3\frac{7}{8}$" long
Material—SAE 1112
Operations—6, including hob 12 serrations
Machine—Acme-Gridley $1\frac{1}{4}$" RA-6 spindle bar automatic with magazine loading
Machining Time—10.7 seconds per piece

Second operations can sop up a lot of production dollars—unless you handle them right.

The *right* way—the timesaving, money-saving way, is to put them on an Acme-Gridley. Its greater versatility permits the liberal use of independent, power-driven auxiliaries—that combine operations, reduce handling, and cut machine overhead.

Take the ratchet shaft job illustrated, for example. Instead of transferring the part to a hobbing machine after the second operation drilling and tapping has been performed, the twelve serrations are machined by a hobbing attachment. Result: one less machine, one less unloading and reloading operation. And magazine loading cuts man-hours and production time still farther.

Wide, open tooling zones, close-coupled camming, rigid construction and plenty of power pay off in more good pieces in the pan every time. These are the practical, dollar-saving kinds of results you can expect from every Acme-Gridley. May we give you more facts, stated specifically in terms of your own needs? No obligation, of course.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Thread Rolling Machines Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Counters • Solenoids Centrifuges • Contract Manufacturing

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looks to Borg-Warner
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Engineering Achievements
and the utmost in
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Packard's Ultramatic

THE interrelationship of engineering, metallurgy, and production associated with the launching of a new program is well exemplified in the development of manufacturing facilities for the Packard Ultramatic transmission. The portion of the plant allotted to the Ultramatic is replete with interesting automatic transfer machines, special machines of every description, and unique processes associated with the use of special materials and combinations of materials. In fact the emphasis on special materials specifications gives evidence of close cooperation among the various groups at Packard.

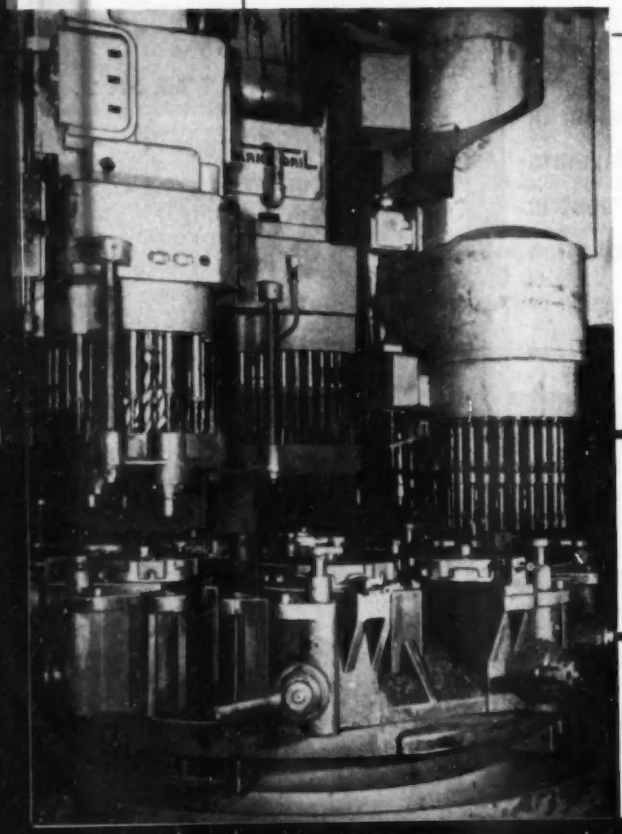
An automatic transmission is composed of so many parts and involves so many precision operations as to make it difficult if not impossible to present more than an arbitrary sampling of operations even in a series of articles. This one deals with the three major castings—the case, bell housing, and clutch housing. Special attention has been given to the control of fine dimensional tolerances and surface finishes. Among other things the housings covered in this study as well as torque converter parts demand pressure tightness because of high fluid pressures, and require detailed inspection procedures on individual parts as well as assemblies to prevent leakage at any point.

Part One

This is the first of three articles presenting some of the most important manufacturing processes employed in producing Packard's Ultramatic transmission. Machining of three major castings—the case, bell housing, and clutch housing—is described and illustrated in Part I. Part II will be devoted to a special report on materials, particularly with respect to composite assemblies joined by silver brazing, heat treatment procedures, and the technique for producing planetary brake band assemblies. Assembly of the transmission in a skillfully planned layout will be dealt with in Part III, the final one in the series.

In the arrangement of machine shop areas each of the three major castings is machined in a self-contained layout of equipment, so designed as to economize floor space, reduce materials handling to a minimum, and in general to reduce supervision to a minimum through the introduction of transfer type machines.

The transmission case is a gray iron casting requiring a large number of operations for its completion. First operation is the milling of the lower joint face, front face, and



This is a special three-head Barnesdril machine with a four-station indexing fixture tooled for drilling the transmission converter clutch housing. It drills a total of 38 holes in each part.

Transmission in Production

By Joseph Geschelin

rear end in a single pass through a 5/48 Cincinnati Duplex three-way Hydro-Mill. The milling cutters are 16 in., 11 in., and 9 in. in diameter, fitted with Wesson metal solid carbide blades. Although this is an extremely heavy metal removal operation, taking about ¼ in. off each face, tolerances on dimensions are held to close limits. Actually total tolerance is specified at 0.005 in.

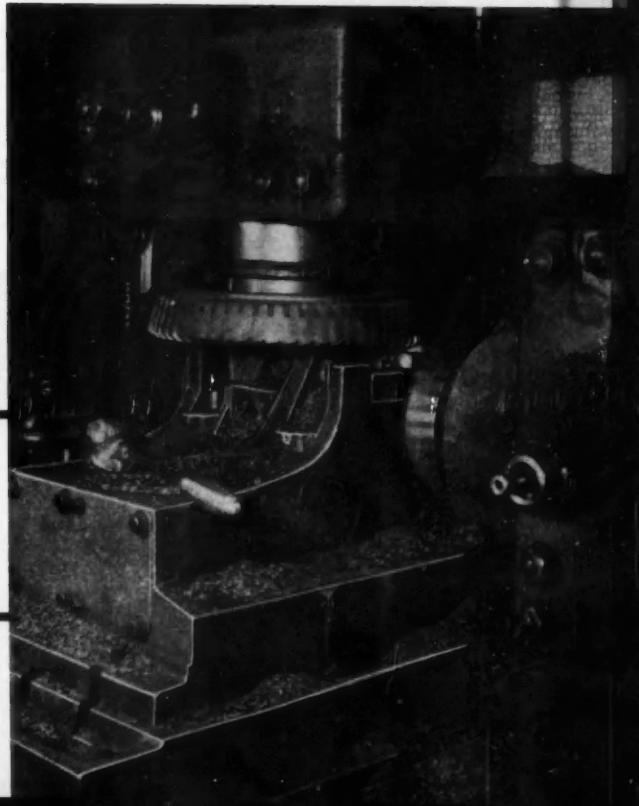
Another heavy milling operation—removing about ¼ in. of metal on each face in a single pass—is found on the special Sundstrand four-head Rigidmil. As illustrated, this is a two-way machine with two heads in front and two in the rear for milling four pads. The work is clamped face down in the fixture while aligned by means of two pins. In the first stage, two mounting pads are milled with six in. diameter cutters. For this operation the cutter head moves downward into position for milling. Then the table is indexed to the second pair of heads for milling the speedometer hole pad on one side and governor cover pad on the other. Here too the cutter heads move down to meet the work.

The major piece of machinery for this part is a line of two Foote-Burt transfer machines. The first battery is an 18-station drilling and tapping machine for drilling, reaming, counterboring, countersinking, spot-facing, and tapping all holes in both sides of the case. The machine is tended by a single operator.

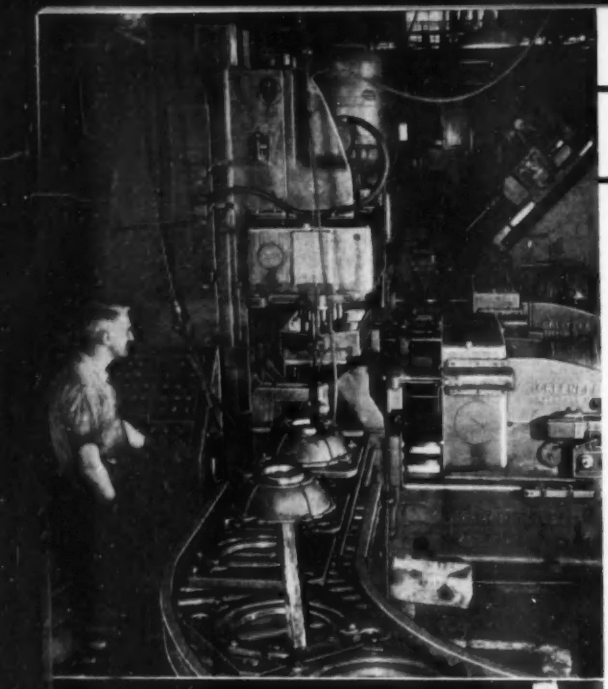
At the exit end of this unit there is a unique special built power-operated spot-facing machine for spot-facing three internally-located bosses. Working space is so cramped that it is necessary to employ a set of cutters which are driven by a small-diameter driver bar introduced after the case has been clamped down.

The case then enters the second Foote-Burt transfer machine which has 14 stations. Here the work is turned so as to present the front and rear end for drilling, reaming, chamfering, and tapping holes in the front and rear end as well as inside. As the case leaves this unit it enters an automatic washer, moving through the washer and out onto a gravity roller conveyor to succeeding operations without manual handling.

Most of the operations on the transmission bell housing are completed in Bullard Mult-Au-Matics and in a 22-station Greenlee automatic transfer machine. The layout is so designed that from the time the housing enters the machine to the completion of all suc-



First operation on the transmission case is milling of the lower joint face, front face, and rear end in a single pass through a big Cincinnati three-way Hydro-Mill. The view here is a close-up of the work station.



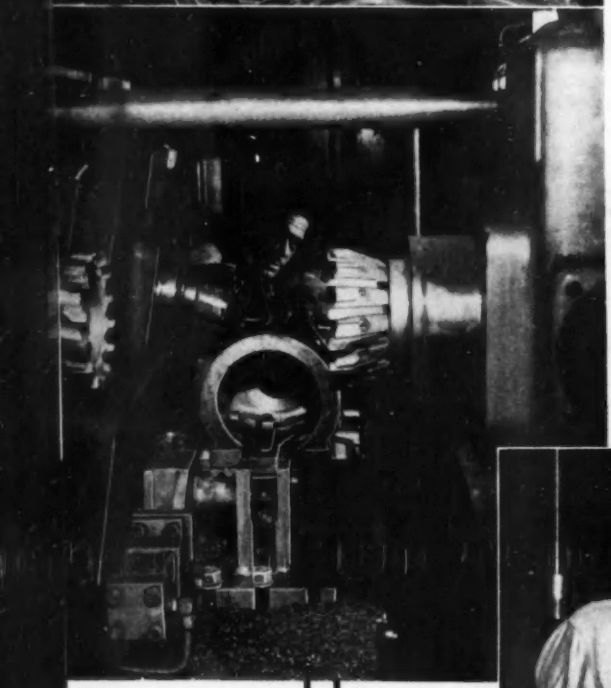
Packard's Ultramatic

Perspective view of portion of the 22-station Greenlee transfer machine for the transmission bell housing.

ceeding operations the work is handled only by the single Greenlee operator. In effect, his station at the Greenlee takes care of loading the Greenlee and unloading from the conveyor which returns work from succeeding machine stages.

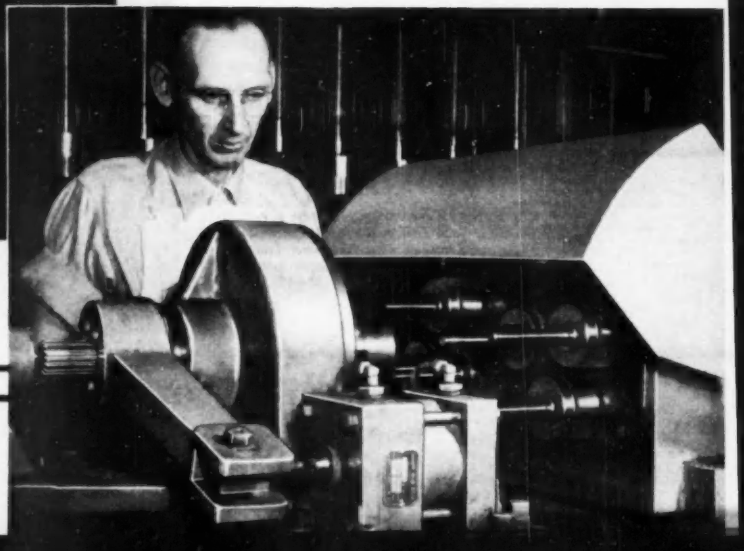
All turning, facing, and boring operations are handled in two 16-in. Type D Bullard, six-spindle Mult-Au-Matics. The first machine does the rough and semi-finish-turning, boring of the face, chamfering bearing diameters, pilot diameters and flange. The second Bullard takes the opposite side for the following operations: rough- and semi-finish turn, bore, face, and chamfer the rear end, and undercut bearing diameter. These machines employ the latest types of cemented-carbide tools in round, square, and triangular cross-sections.

The 22-station Greenlee transfer machine is used for drilling, spot-facing, countersinking, chamferin rough- and semi-finish reaming, and tapping of a holes in the bell housing. The line-up of units at var



Another heavy milling operation, removing about ¼-in. of stock, is handled in a special two-way, Sundstrand four-head Rigidmil. Work is indexed automatically from the first to the second station, the cutter heads being arranged to move down to meet the work.

Closeup of work station of one of the latest of the New Britain Model 27, six-spindle precision boring machines. The set up shown here is for precision-boring the six holes in the planetary cage and output shaft assembly.



Transmission in Production

About mid-way along the Greenlee transfer machine is this unique station. At this point the bell housing enters the fixture and is rotated 90 deg to register with succeeding fixtures. Then the entire fixture is tilted vertically 90 deg to permit the drilling of a cluster of holes.

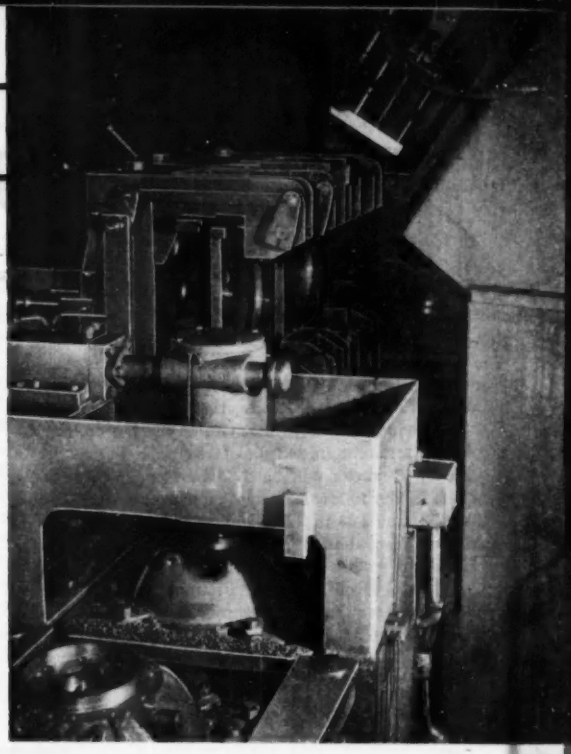


Table I

Station		
1	Idle	
2	Vertical unit Drill 14 holes, countersink one hole	RH horizontal unit Drill two holes
3	Vertical unit Drill 10 holes	RH horizontal unit Drill three holes
4	Idle	
5	Vertical unit Drill 14 holes	RH horizontal unit Tap two holes
6	Vertical unit Countersink 8 holes, drill two holes, ream one hole	RH horizontal unit Ream and tap two holes
7	Idle	
8	LH horizontal unit Spotface 10 holes	RH unit Drill one hole
9	Angular unit Drill one hole	RH horizontal unit Spotface one hole
10, 11, 12	Idle	
13	LH horizontal unit Drill two holes	RH horizontal unit Drill two holes
14	LH horizontal unit Drill and countersink one hole	LH horizontal unit Drill two holes
15	Idle	
16	LH horizontal unit Combination core drill one hole	RH horizontal unit Combination core drill one hole
17	Idle	
18	LH horizontal unit Ream one hole	RH horizontal unit Rough ream one hole
19		RH horizontal unit Semi-finish ream and chamfer one hole
20	Idle	
21	LH horizontal unit Tap one hole	Vertical unit Tap one hole
	RH horizontal unit Tap two holes	
22	Unload to washer	

ous stations is as shown on this page in Table I.

A unique feature of the Greenlee is found at Station 8. As the work enters this station it moves into a special fixture in which it is first indexed around by 90 deg, then clamped. Immediately following this the entire fixture is turned vertically by 90 deg to present the open face to the horizontal unit for spotfacing 10 holes. While in this position the RH head drills the single hole. The cycle is completely automatic and timed with the overall cycle of the machine.

Packard has installed in several departments a number of special machines supplied by Hoern & Dilt of Saginaw. The unit for the bell housing is a Model 4-4 vertical indexing type precision boring machine with three working stations, Station 1 being used for loading and unloading. Station 2

(*Turn to page* 43, *please*)

Here is a perspective of one of the Foote-Burt transfer machines for the transmission case.

New Dodge Truck Has

To round out its coverage of the heavy duty transportation field, Dodge Div., Chrysler Corp., has introduced a new truck—The Model Y—with a nominal rating of four tons; 28,000 lb GVW maximum, and up to 50,000 lb GCW. Body and payload allowance runs up to 19,800 lb. Among the outstanding features of this model is a new six-cylinder Dodge engine developing a maximum output of 154 bhp.

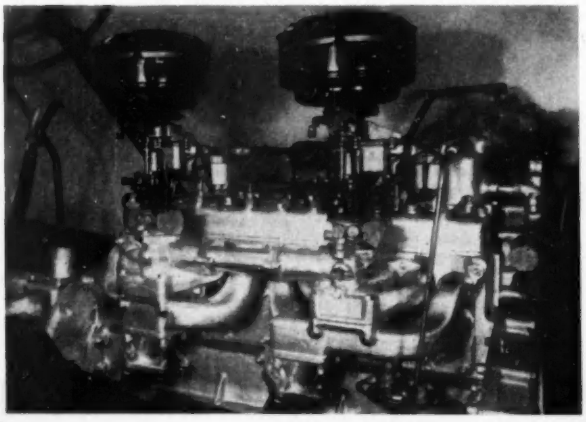
Model Y trucks will be available in 30 basic GVW models in the following range of wheelbases: 130, 142, 154, 172, and 190 in. Dodge now offers a total of 396 basic GVW models.

The new engine—see condensed specifications—has many features of interest. Pistons are of aluminum alloy, steel strut type, tin-plated, and fitted with four rings, the top ring being chromium-plated. Unusual economy is said to result from the twin carburetion induction system, incorporating two plain-tube, down-draft carburetors. The system also includes two oil bath type air cleaners; two ceramic gasoline filters; two velocity-type governors, and an anti-vapor-lock fuel pump. Twin intake manifolds with short passageways and individual ports for each cylinder assure good mixture distribution. This is supplemented by a twin exhaust system, said to reduce back pressure and thus improve engine efficiency.

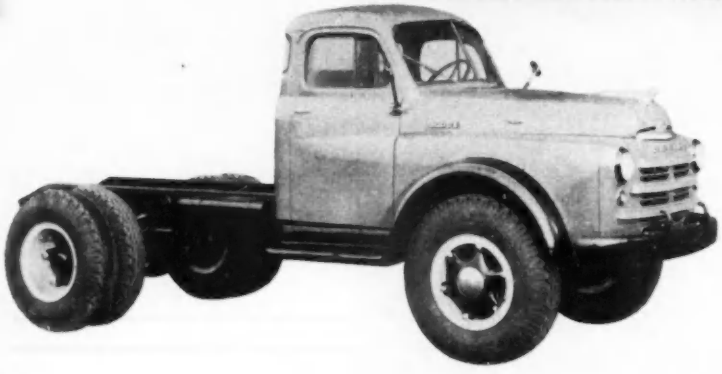
The valve train also provides some exceptional features. For one thing, this engine is fitted with hydraulic valve lifters as standard equipment. Intake and exhaust valves have hard seat inserts—Silchrome inserts for intake valves; Stellite-faced Silchrome inserts for exhaust valves. Intake valves are of Silchrome while exhaust valves are Silchrome, Stellite-faced, and sodium-cooled. In addition, a rust-proof water distributing tube and large water passages around valve stems assure maximum heat dissipation.

Condensed Specifications
New Dodge Engine for Model Y Trucks

Type	L-head
No. cylinders	6
Bore (in.)	4
Stroke (in.)	5
Displacement (cu in.)	377
Compression ratio	6.5 to 1
Gross bhp (max.)	154@3000 rpm
Net bhp (max.)	140@2800 rpm
Gross torque (max., lb ft)	330@1200 rpm
Net torque (max., lb ft)	319@1200 rpm
No. main bearings	7



Right side view of the engine showing twin carburetors, two intake manifolds with individual leads to each cylinder, twin exhaust manifolds and pipes, etc.



The entirely new heavy-duty Dodge Y and YA model trucks have a nominal rating of four tons, a GVW of 28,000 lb, and a GCW of 50,000 lb.

154 H.P. Twin Carburetor Engine

Standard 18,000 Lb Capacity Rear Axles For B-2-Y and B-2-YA Models

Model	Type	Capacity	Ratios
B-2-Y	Single-speed	18000 lb	6.83:1
B-2-YA	Two-speed	18000 lb	6.53/8.53:1

Extra Equipment 18,000 lb Capacity Rear Axle for B-2-Y

Model	Type	Capacity	Ratio
B-2-Y	Single-speed double red.	18000 lb	8.53:1

Extra Equipment 22,000 lb Capacity Rear Axles for B-2-Y and B-2-YA

Model	Type	Capacity	Ratios
B-2-Y	Single-speed	22000 lb	7.4:1
B-2-Y	Single-speed double red.	22000 lb	9.23:1
B-2-YA	Two-speed	22000 lb	6.41/8.37:1
B-2-YA	Two-speed	22000 lb	7.27/9.49:1

The crankshaft is of seven-bearing type with nine counterweights, dynamically balanced. Main and connecting rod bearings are of replaceable precision type.

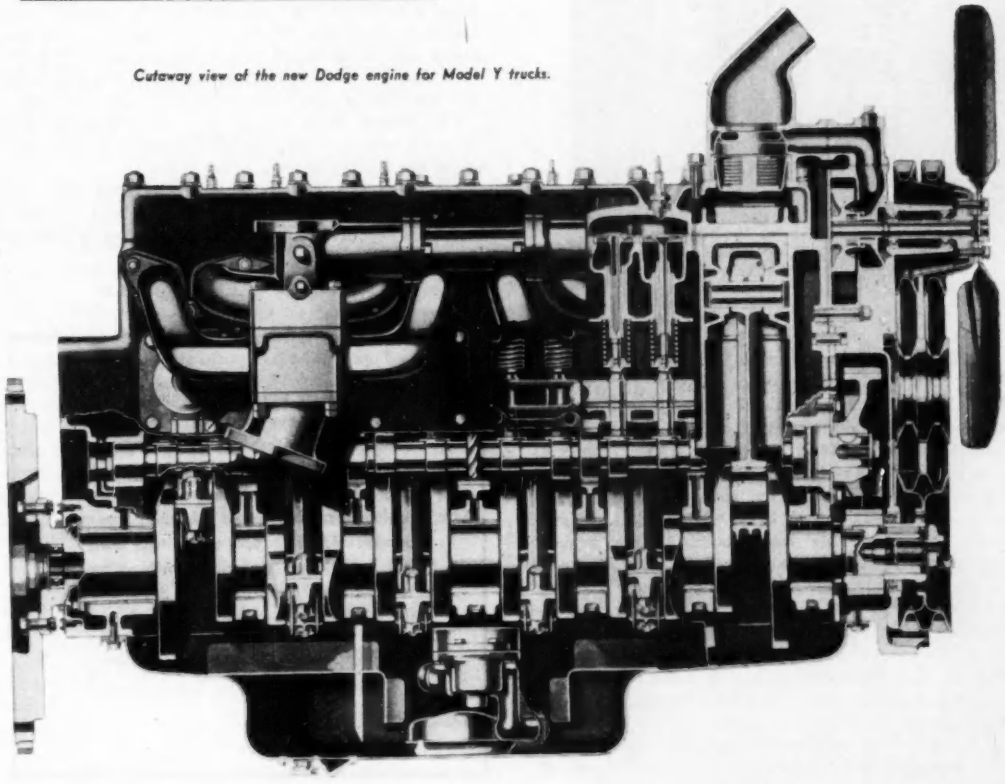
Full pressure lubrication and full crankcase ventilation also have been provided.

The electrical system includes resistor type spark plugs, an air-cooled 40-amp generator, voltage-current regulator, automatic spark advance, heavy-duty battery, and starter arranged to have the pinion teeth engaged with the ring gear before electrical contact is made.

The cooling system is of pressure-sealed type, having a capacity of 34 qt, with a radiator frontal area of 568.75 sq in. Full length water jackets provide uniform and adequate cooling. A thermostatically controlled by-pass is employed for quicker and more uniform warm-up.

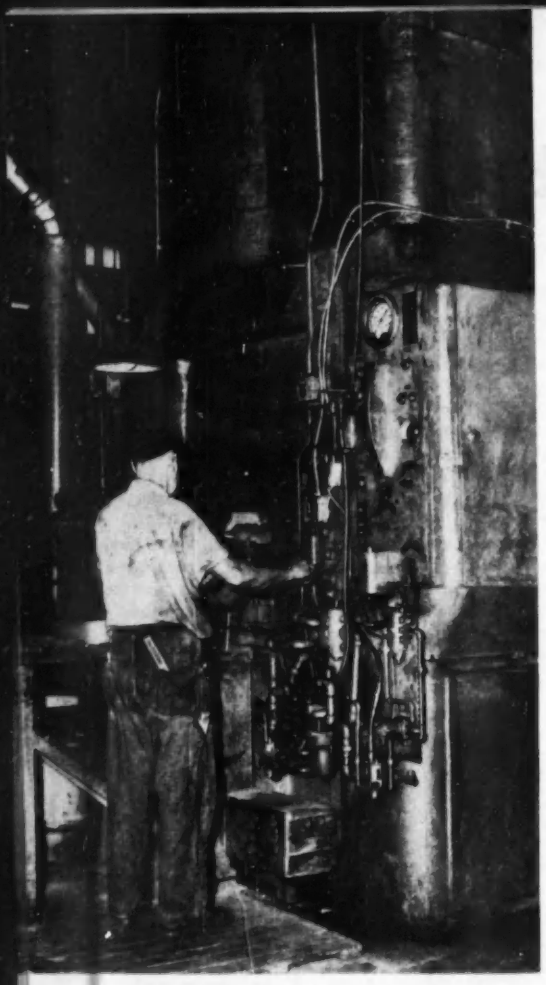
(*Turn to page 74, please*)

Cutaway view of the new Dodge engine for Model Y trucks.



Sintered Metallic *Have*

By Clyde S. Batchelor
Chief Engineer, Passenger Car and Light Truck Brake Linings and Metallic Friction Materials, Raybestos-Manhattan, Inc.



Automatic, 1300-ton molding press for high speed production of sintered metallic friction material parts.

SINTERED metallic friction materials have been produced for many years, but it was not until the late war that they assumed a prominent position in the friction field. At that time the special characteristics of sintered metallic friction material were recognized as ideal for Ordnance. Vast quantities of powdered metal parts, such as airplane brake lining disks, tank turret brake lining, tank master clutch rings and ring segments, tank cone brakes, automatic transmission plates for tanks, tractor steering clutch facings, earth-moving machinery steering clutch disks and brake band segments, and precision-made aircraft parts such as impeller drive clutch disks and supercharger plates, were manufactured during the war. The Raybestos Division, of Raybestos-Manhattan, Inc., a pioneer in the friction field, was one of the largest producers of these parts.

With its broad wartime application, many equipment manufacturers and engineers became aware of the special properties of this "new" type friction material and of the possibilities that these special properties offered in the solution of their problems.

Some of the outstanding physical characteristics associated with powdered metal friction materials are high thermal conductivity, resistance to high temperatures, permissible high operational unit pressures, and resistance to oil and moisture deterioration. From the above list of desirable properties, it can be readily seen that full-metallic friction materials will find their best application under any of the following conditions:

(*A*) Where there is difficulty in dissipating heat from a brake or clutch, sintered metallic friction material has a high thermal conductivity.

(*B*) Where a clutch is under-designed and the clutch is of the multiple disk or pack type, sintered metal may provide an advantage because it can be

In general, sintered metallic friction materials are more expensive than those compounded with an asbestos base, but where quantity production is involved and automatic equipment and modern tooling are warranted, sintered metal can be sold as cheaply as an organically-bonded friction material. Sintered metallic friction material is not a panacea for all friction problems, but it is safe to say that it is entering an era of expansion and will, undoubtedly, continue to find new and greater fields of application.

Friction Materials
Many Automotive Applications

manufactured with an overall thickness which will permit the use of extra disks in the pack. Since each square inch of friction material must absorb its share of the total power transmitted, the use of extra plates provides additional square inches of area and will, therefore, decrease the unit heat load and also the heat generated per surface. In addition to decreasing the heat or energy absorption per square inch of friction surface, the extra plates also provide greater radiating surface.

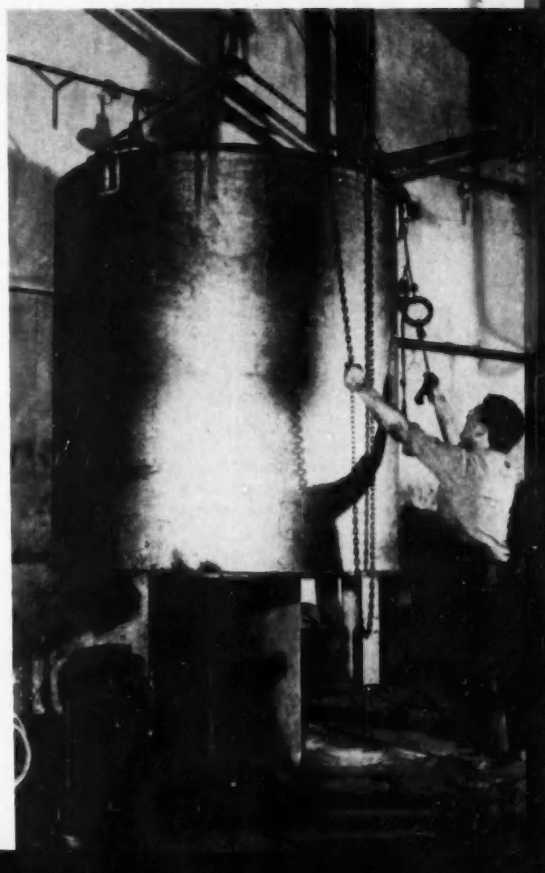
(*C*) Where it is found that oil may work its way into brakes or clutches, resulting in conditions such as glazing or grabbing, it may be found that sintered metal can be successfully used because oil does not affect the metal. When oil is present on a sintered metal surface in normally dry operation, it will definitely drop the friction value for a time, or until the heat generated in the clutch distills off this lubricating film. When the film does distill off, or is broken as a result of increasing pressure, in the case of a brake, the sintered metal is as good as ever.

(*D*) Where a friction material is required to operate in an oil bath, sintered metal products find excellent application. With sintered metal, it is possible to utilize very high unit pressures, which are particularly desirable in an oil bath because of the relatively low friction of any material operating so submerged. The high heat conductance of the friction plate quickly conveys the heat to the oil bath and prevents the burning of the friction surface.

Sintered metallic friction material may be broadly thought of as being compounded around a skeleton pattern consisting of a matrix (usually copper and tin—but may be iron in an iron-base alloy), friction-augmenting agents and wet and dry lubricants. Its basic structure is simple and consists of forming a relatively strong bronze alloy in which is incorporated the friction-augmenting agents and the lubricants. Lead, being insoluble in bronze, is virtually the only wet lubricant used, and graphite is virtually the only dry lubricant used. In brief, the higher the percentage of alloying metals, the nearer the sintered metal will approach the properties of a cast or rolled product.

The metal particles used in compounding the friction elements are commonly finer than 150-mesh and should be erose in shape and preferably porous for good molding characteristics. The first step in processing is that of weighing the metal powders and other ingredients and mixing them in a Read or Ray mixer. The powder is then molded to the desired shapes in hardened steel molds in hydraulic presses, at pressures on the order of 20,000 psi. A battery of presses ranging from 120,000 to 6,000,000 lb will cover the range of most production requirements. In general, all small presses are of the automatic type, loading and pressing from 10 to 40 wafers per minute. Larger presses are usually manually operated but can be converted to automatic production provided the volume is sufficient

(*Turn to page* 78, *please*)



Bell type furnace being lowered over a charge.

The Trend in Europe to Torsion

PROMINENT in European trends is the adoption of torsion bar suspension, usually replacing laminated springs and occasionally coil springs. The movement is far from new and, although the origin of suspension by torsion bars is rather obscure, there appears to be no duobt that the first use of torsion bars in big production was by André Citroen in 1934. With the realization that he was losing heavily on the home market, particularly to Renault, the decision was taken in 1933 to put a more modern type of Citroen car on the market. The choice was between a somewhat conventional type of car which could not hope to hold a technical lead for more than a couple of years, and a revolutionary front-wheel drive, unitized frame-body car with independent front suspension and torsion bars all round. The model which underwent its first trials in September, 1933, and was on the market in April, 1934, has undergone no basic changes since that date and is still the biggest production job in France. To the original four cylinder has been added a six-cylinder model of the same general design and with the same suspension.

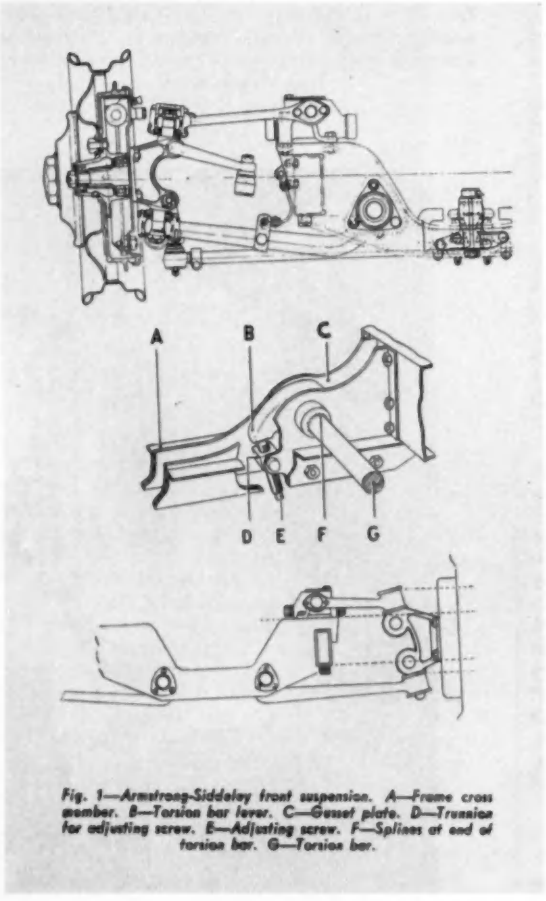


Fig. 1—Armstrong-Siddeley front suspension. A—Frame cross member. B—Torsion bar lever. C—Gusset plate. D—Trunnion for adjusting screw. E—Adjusting screw. F—Splines at end of torsion bar. G—Torsion bar.

There was little following for several years. Dr. Porsche did some independent work on torsion bars and they were adopted for racing purposes by both Auto Union and Mercedes as well as on a fast sports model produced by B.M.W. at Munich. Hotchkiss used torsion bars on a model designed by J. A. Gregoire in 1936. The same system of suspension was provided on the car which Gregoire designed for an English group but which, for other than technical reasons, never went into production. There does not appear to be a single case of a manufacturer having dropped torsion bar suspension, but there are several instances of bars replacing leaf and coil springs either for rigid axle or independent suspension.

In the postwar period there has been a pronounced move toward torsion bars, usually combined with independent wheel suspensions. The accompanying list gives the European passenger cars at present equipped with torsion bar suspension. In addition to them, Mercedes and Auto Union racing cars, not in regular production, have torsion bar suspension and Chenard & Walcker has produced a special type of torsion bar composed of a pack of small-diameter square-section rods.

A review of the cars in production shows an absence of uniformity of design, but nevertheless there is a tendency to embody torsion bar springing with independent front wheel suspension of the wishbone suspension arm type, the rear springs being of the conventional semi-elliptic type. Exceptions to this are Bristol and Frazer-Nash, with a transverse spring in front and torsion bars

Bar Suspension

Part One

With a decided trend to torsion bar suspension in European passenger car development, AUTOMOTIVE INDUSTRIES has compiled a special series of two articles dealing with which manufacturers are using this type of springing and descriptions of typical designs. The first of these articles is presented here, giving details of torsion bar systems on seven makes of European passenger cars. Others, including the Lagonda, Vauxhall, Panhard, Bristol, Volkswagen and Mercedes designs, will be described in the second article to be published in an early issue of AUTOMOTIVE INDUSTRIES.

By W. F. Bradley
Special European Correspondent for
AUTOMOTIVE INDUSTRIES

at the rear; the Lagonda which has diagonlly mounted torsion bars at the rear and coil springs in front; the Panhard Levassor on which laminated transverse springs are used in front with torsion bars for the rear; and the Jowett, which is the only English car having torsion bars front and rear.

The use of torsion bars gives a high degree of freedom to the designer in the layout of the chassis, for there are alternative positions for the placing of the suspension parts. The system used by Armstrong-Siddeley is fairly typical of modern practice. The steering knuckles are held at the top and bottom by link arms of different lengths, the upper support arms having their ends engaging with the shafts of hydraulic piston-type shock absorbers, bolted on top of the chassis frame member. The lower support arms engage with splined shafts which are supported at each end in splined sleeves carried in rubber mountings bolted to the box section of the frame cross member.

The extension of the rear splined sleeves engages with the splined forward ends of the torsion bars, thus connecting them to the lower link arms. As shown in Fig. 1, the rear ends of the torsion bars are splined and fit into the torsion bar levers (B). These levers are pivoted in a frame cross member and the ends of the levers butt against the ball head screws carried by trunnions (D) which are also pivoted on the frame member. The ball head screws alter the angular adjustment of the torsion bars so as to raise or lower the front of the car within certain limits. On the Armstrong-Siddeley the torsion bars have a length of 22.7 in. and a diameter of 1 1/16 in.

The Jaguar, Fig. 2, which has been produced with independent front wheel torsion bar suspension this year, has silico-manga-

European Cars in Production with Torsion Bar Suspension

Citroen—front and rear.
Chenard-Walcker — front and rear.
Bristol—rear only.
Armstrong-Siddeley—front only.
Fraser-Nash—rear only.
Jowett—front and rear
Jaguar—front only.
Lea Francis—front only.
Lagonda—rear only.
Morris—front only.
Riley—front only.
Panhard—rear only.
Salmson—front only.
Wolseley—front only.
Volkswagen—front and rear.
Vauxhall—front only.

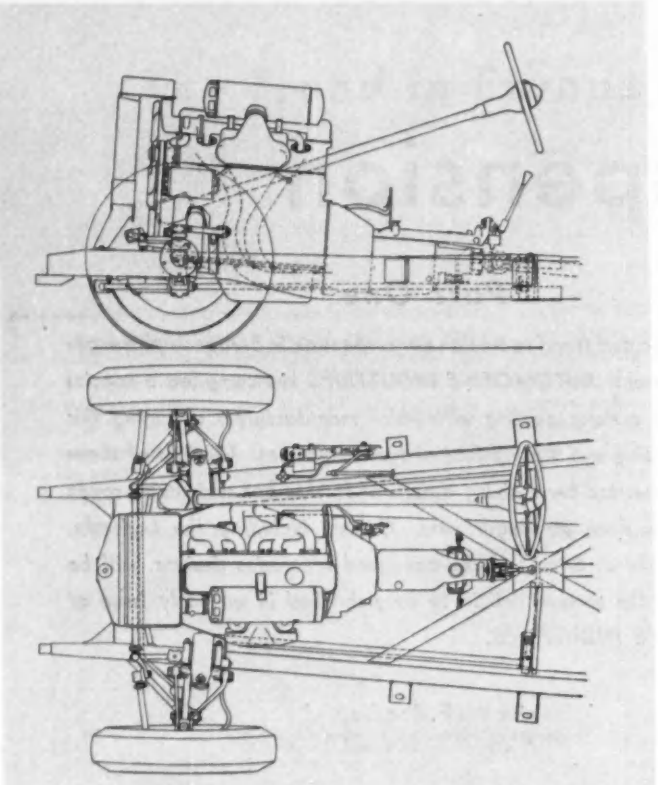


Fig. 2—Side and top views of the Jaguar front suspension.

nese steel bars with a length of 51 in., this exceptional length permitting low stress and insuring practically an unlimited life. The layout comprises a very rigid box section frame, straight in both planes, having a maximum section at the dash of 6½ in. deep and 3½ in. wide, tapering at the front and the back. Torsional rigidity is assured by 7 in. deep channel section cross bracing and by a heavy box section front cross member in the same plane as the side members. The mounting of the torsion bars is fore and aft, the mounting being so arranged that they are free from any bending strain caused by braking or other extraneous force. The bars can be rapidly changed without disturbing any other part of the suspension, and a screw adjustment at the rear makes it possible to adjust tension without the use of any special equipment. The layout features wishbone support arms of unequal length, the lower one being braced by a long tubular strut giving wide base mounting into the frame. The steering knuckles are special in that they are carried on ball joints at the outer ends of the top and bottom wishbones. These joints are self adjusting. The ball pins have a hard chrome surface and the cup is in a special graphitic bronze. This combination assures a low coefficient of friction under all conditions.

In the Riley system, as illustrated in Figs. 3 and 4, use is made of circular section unequal length wishbone support arms anchored to a box-section cradle cross member, which also supports the front of the engine. The support arms are anchored to this cradle, while the rear anchorage of the fore and aft torsion bars is to brackets welded to a tubular frame cross member. Direct-acting hydraulic shock absorbers connect up from the outer ends of the lower support arms to the head of the cradle forming the chassis cross member. The chassis side rails being box section, a front-end construction of exceptional rigidity is secured.

Jowett, the only English firm using torsion bars all round, has a standard type front and rear, although the front wheels are independently sprung and a rigid axle is used at the rear. The bars have a diameter of 0.880 in. and a length of 36.25 in. They are in silico manganese spring steel and were adopted after extended road tests.

The rear bars are mounted parallel across the frame, as shown in Fig. 6, slightly inclined so that their free ends are on the same level. Parallelogram linkage car-

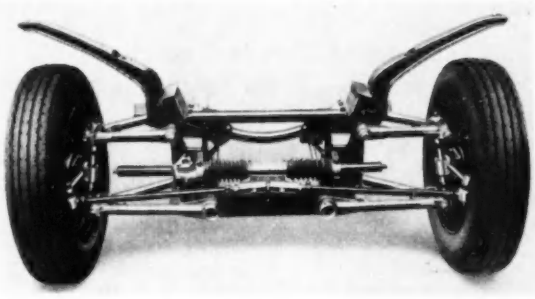


Fig. 3—Front view of the Riley front suspension.

Torsion Bar Suspension

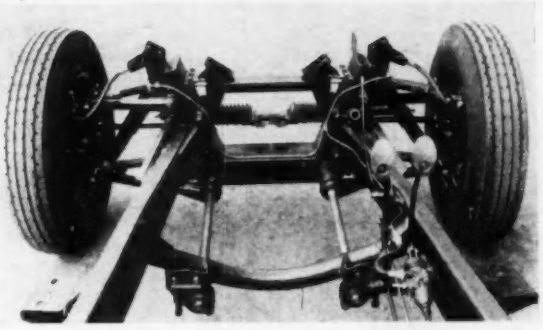


Fig. 4—Rear view of the Riley front suspension showing arrangement of the torsion bars.

ries the axle, the upper links being 13⅝ in. in length and joined to the octagon-ended torsion bars. The static load on the spring arm eye is 712 lb. Stress with above load is 73,450 psi; angular deflection with this load 29 deg and from normal static to full bump 20 deg. Wheel deflection at normal static load is 6½ in. and spring periodicity is 73 cycles per min.

Front suspension is of the parallel link type, lengths being 7¾ in. for upper and 15 in. for lower links. The torsion bars are located inside the main frame members, their free ends fitting into sockets at the inner end of the lower links. Wheel deflection is seven in. and spring periodicity 71 cycles per minute. No adjustment for spring setting is provided with this system. The Jowett is a car having a shipping weight of 2168 lb.

Latest recruit to torsion bar suspension is the Nuffield organization, both the Morris and the Wolseley models having independently sprung front wheels with laminated springs at the rear. While the Wolseleys enter the medium price class, the Morris models are built to a really competitive price, which is an indication that torsion bars are not ruled out because of cost. The design of this "Paratorsion" suspension is the same on all the models, and has been laid out with close attention to production costs. The design features wishbone support arms of unequal length. The lower links each consist of a steel pressing at the front and a steel forging at the rear, the two being bolted together. As shown in Fig. 7, from the outer end of the lower link there is a tie bar which runs forward at an angle to a bracket on the frame to which it has rubber-mounted anchorage. The upper link is formed of the two arms of the shock absorbers mounted on box section brackets forming part of the body shell. The outer ends of the upper and lower support arms carry the steering heads and steering

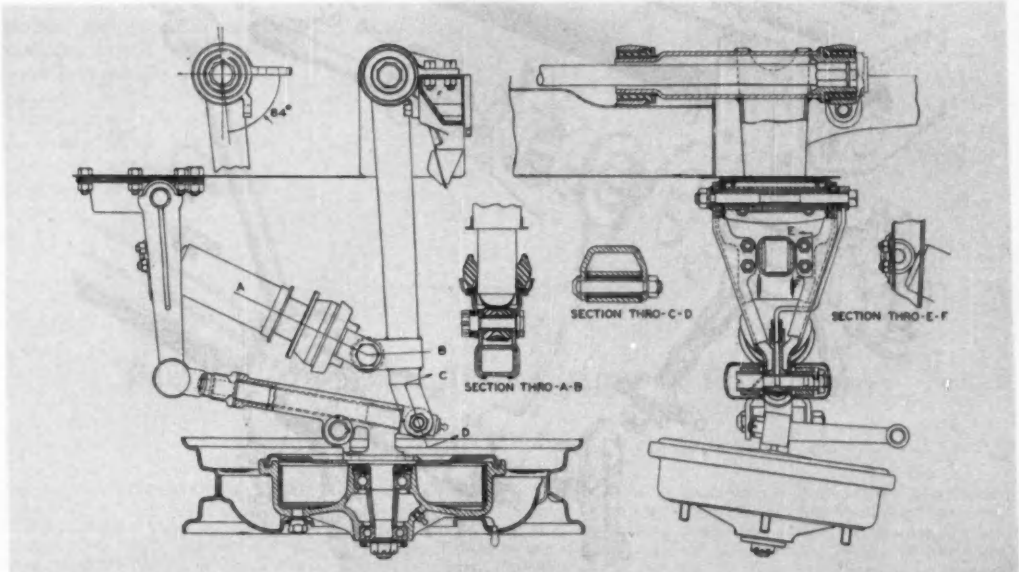


Fig. 5—Part-sectional view of the Jowett front suspension

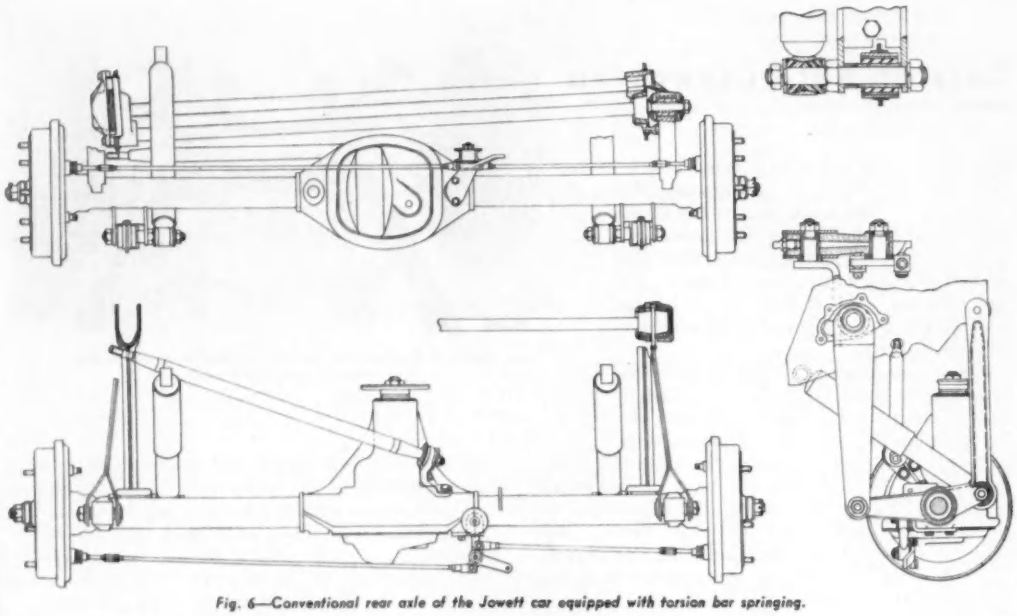


Fig. 6—Conventional rear axle of the Jowett car equipped with torsion bar springing.

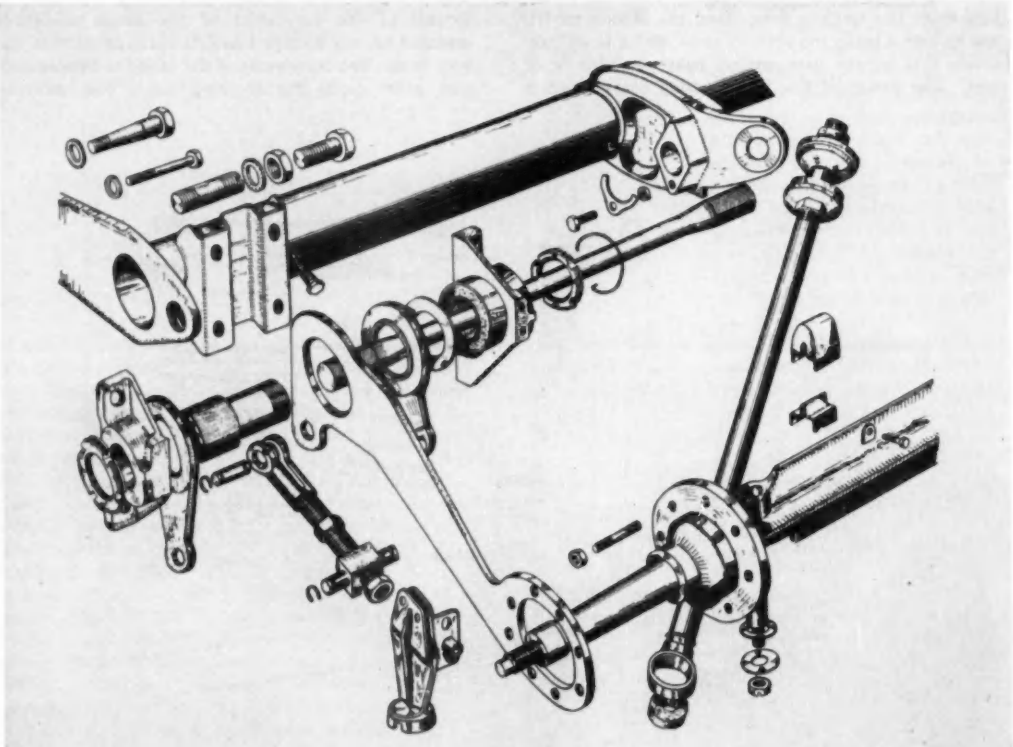


Fig. 9—Exploded view of Citroen rear suspension.

Torsion Bar Suspension

knuckles in long phosphor-bronze threaded bearings. The lower link is splined on the front end of the torsion bar, which runs fore and aft parallel to the main frame member and is held at the rear end in a bracket on a frame cross member with provision for adjustment setting or loading.

Citroen's pioneer system, which seems to have inspired some of the more recent converts to torsion bar suspension, features a cradle to which the links are very rigid box section forward pivoted, the upper one being a moderately open V and the lower one an H-section forging to which the front end of the torsion bar is splined, the two bars being below and parallel to the trailer, the rear torsion bars are engine. The rear axle being a mounted in backets welded to a large diameter tubular cross member, with link connection from the axle to the suspension member. The design has undergone practically no change since it was first introduced.

Part II of this article on European torsion bar suspensions will be published in an early issue of AUTOMOTIVE INDUSTRIES.

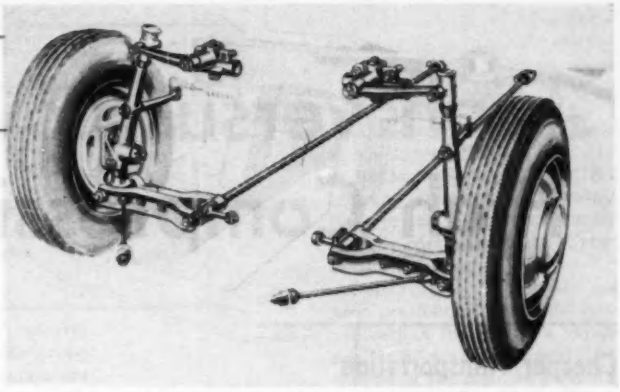


Fig. 7—Phantom view of front suspension layout on the 1949 Morris-Oxford. The two Wolseley models have front ends of the same design.

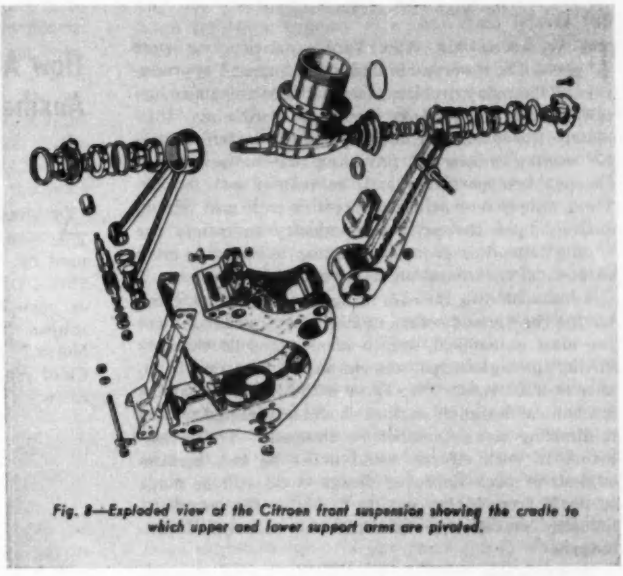


Fig. 8—Exploded view of the Citroen front suspension showing the cradle to which upper and lower support arms are pivoted.

Packard Ultramatic Transmission in Production

(*Continued from page* 33)

does the semi-finish boring of a diameter "X," finish-boring of diameter "W," and undercutting. Station 3 finish faces surface "T." Station 4 finish-turns diameter "Z," finish-bores diameter "Y," and finish reams diameter "X."

The converter clutch housing, made of malleable iron, is rough turned, faced and bored, in a series of chuckings in two Bullard Mult-Au-Matics, followed by drilling in two special Avey drilling machines. Finishing operations then are completed in a third Bullard. Another of the special purpose machines for this part is a big three-head Barnesdril unit having a rotary indexing table with four double fixtures, handling eight pieces. In loading the fixture the operator places one part face up, the other face down so as to complete one piece on both sides for each cycle. This machine drills and taps all holes in top and bottom faces.

High versus Low Octane High Compression Engines

Cheaper Transportation A Vital Need

By W. M. Holaday
Director,
Socony-Vacuum Laboratories

IN reviewing Mr. Alex Taub's articles, we were pleased to observe his understanding and appreciation of the many problems facing the petroleum industry; also his grasp of the economics of refining. Ultimately, the automotive and petroleum industries should be seeking means of providing the motorist with cheaper transportation and, as pointed out by Mr. Taub, simply increasing compression ratio and relying entirely upon the petroleum industry to satisfy the engine detonation requirements may not provide more economical transporation to our mutual customer.

As we look over the cars being produced today, those having the highest octane number requirement are not the most economical, nor in many cases do the cars having the highest requirement have the best performance characteristics. We agree with Mr. Taub that the mechanical design of engines should be directed toward minimizing octane number requirement. The investments in such efforts would never be lost because engines of such improved design could still be made to profit from higher quality fuels, as the petroleum industry makes them available by economical procedures.

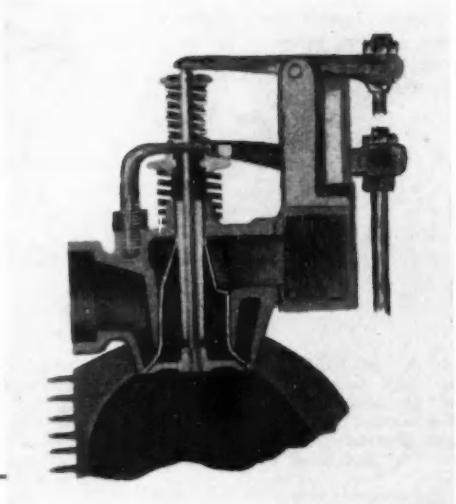
In connection with the remarks on surface tension we wish to comment that there is little difference in the surface tension of the various hydrocarbons in the gasoline boiling range. We have not recognized it as an important variable in the distribution problem.

As previously pointed out, we have tried to emphasize the importance of looking at the overall vehicle, and we expect that developments in the field of transmissions will ultimately lead to improvements in economy. At the present time the efforts in the field of automatic transmissions appear to be directed primarily toward providing additional convenience in driving. As more attention is devoted toward the potentialities of the automatic transmissions from the standpoint of economy, we will achieve a more efficient utilization of the antiknock quality of our motor fuels.

How About Poppet Auxiliary Valves

By Carl T. Doman
Ford Motor Co.

AS I read the articles many ideas came to my mind, one of which was the so-called concentric valve used by the Franklin Automobile Co. from 1908 to 1910. Of interest is the illustration which appeared on page 79 of the 1910 SAE Transactions under the subject "Tests of a 20 H.P. Franklin Air-Cooled Motor." Even back in 1910 Mr. Wilkinson, Franklin Chief Engineer, was attempting to cool an exhaust valve.



View of concentric valve with dome-head cylinder used in Franklin aircooled engine in 1910.

Discussions Are Presented Here on the Articles, "High Compression Without High Octane Fuel" by Alex Taub, Which Were Published in Recent Issues of AUTOMOTIVE INDUSTRIES. Another Article by Mr. Taub Will Appear in an Early Issue.

In discussing this design with Mr. Wilkinson, I am told that after using the concentric valve in production for approximately two years he dropped it to return to a separate inlet and exhaust valve due to mechanical problems which at the time did not seem readily solved.

Another interesting design, in addition to the one main valve in the cylinder, had an additional inlet valve and an additional exhaust valve to take care of the intake and exhaust gas. It appears to me that the use of poppet auxiliary valves would accomplish the same result and, at the same time, keep the one main valve which would, of course, be alternately an intake and an exhaust valve.

Supercharged Engines Favored

By R. J. S. Pigott
Director of Engineering
Gulf Research & Development Co.

FOR a period of years I have been pointing out that there was a likelihood of octane number not increasing much further on account of the limits imposed by refining methods and the effect on the total quantity of fuel produced. To this end I had pointed out in several papers and speeches that there were many leaves left unturned in the design of the engine which might give us a much lower octane demand for any specific compression ratio.

Dr. Kettering coined the term "mechanical octane number" which is without doubt, like much of his skilled choice of phrasing, a very quick way of presenting the matter before the average audience. In my opinion it conveys slightly the wrong impression of what is being done, and Mr. Taub's article helps to correct this. What we are doing is not improving the fuel by mechanical octane number of the engine, but reducing the appetite for chemical octane numbers.

I think it is now well established that any condition in the incoming charge which affects the final flame temperature will affect the octane demand of the engine; therefore, the major points at which we must look are: (1) Reduction of temperature of the incoming charge, and (2) reduction of all high temperature spots in contact with the charge during compression.

Referring to (1), it has not been possible to reduce the temperature of the incoming charge for straight single compression engines of the type we generally use because it is apt to interfere with vaporization of the gasoline. This would not be of any great moment in engines running at constant speed, such as stationary service, but is of great importance for those running at speeds from idle to full throttle, such as passenger cars, trucks and contractors' equipment. An important way in which temperature can be reduced is the supercharged engine; it is my belief we will see a major development in supercharging within the next few years. In this case the compression is two-stage and the expedient of cooling the charge after the first stage is obvious and easy. We proved the ease of this expedient in the racing car engine designed a few years ago, in which 82 ASTM octane gasoline (an insensitive fuel of not over 83 Research octane) operated successfully with overall compression ratio of 13.5 (2.25:1 supercharge, 6:1 cylinder compression). The temperature was dropped at the engine intake about 55-60 degrees.

With regard to (2), it seems quite clear that the first step is to improve the general cooling of the cylinder, a job which, I think it may be said, has not been adequately accomplished in many designs up to now. It has been found by checking dimensions that many engines on the market have flow in the jackets in the viscous region. This viscous flow does not occur overall but only in some places. An excellent example is an engine design of a few years ago in which very large space between the two cylinders formed part of the jacket path and velocities through it were very low. If we have velocities so low that viscous flow can be obtained, then striation occurs, and proper cooling cannot be obtained. This would account for considerable variation of temperature in walls of the cylinder, possibly also the head, and aside from not cooling the cylinder uniformly, gives rise to considerable unnecessary distortion. Raising velocity of flow through the jackets would eliminate this trouble completely. Some of the commercial designs on the market have provided special jets for bringing the cool incoming water around the exhaust valve. This expedient proves positively that the velocity around the cylinder is not high enough as designed. If the velocities are high enough, no such thing as local boiling can occur and special jets would be found quite unnecessary.

We know from our work in steam condensers and other heat transfer apparatus that increase in heat

transfer occurs with increase in velocity. At the present time we do not think of velocities less than five to seven fps for the coolant. I do not believe there is a single jacket on the market in a commercial engine in which the velocity is anywhere near so high.

The next spot to be considered, and a most important one, is the exhaust valve. Much of Mr. Taub's discussion is pointing the way toward avoiding the hot exhaust valve, either with the single valve design in which the valve in addition to being cooled by way of the seat is also cooled by being used substantially as an intake valve as well as exhaust valve. The sleeve valves and the conical rotary valve of Aspin are another path by which the hot exhaust valve is eliminated. These all carry with them their own disadvantages, but it would seem that none of these designs have received sufficient technical attention yet to see what they can do, with the possible exception of the sleeve valve. There have been from time to time other designs, one of which I saw in a racing engine 10 years ago, in which a rotary valve was utilized. The problem with the rotary valve has always been lubrication, but it appeared in this design, which had been run quite successfully on the block and in a racing car, that this problem had been solved in at least one design. It is my opinion that the sodium cooled exhaust valve is an improvement over the ordinary valve, but is not sufficient improvement to solve this whole question. When supercharging the engine is at last taken seriously, the present designs of the engines will have to undergo very careful scrutiny not only for strength but to eliminate these present critical points. My thought is that we shall see engines supercharged up to 25 lb gage (supercharge comp ratio 2.7:1). In this case it seems to me that the present designs with relatively badly cooled exhaust valves will not be adequate.

Self-Dampening Combustion Chambers

By W. S. James
Vice-President
Fram Corp.

IT is certainly good to see that someone is pointing out the possibility of using high compression without spending tremendous sums of money in the development of special fuels.

I took a crack at this idea a year or so ago in trying to present some of the various ways that high fuel economy can be obtained without necessarily using high compression. I hope your efforts will be successful in arousing interest in mechanical design for the utilization of high compression without the present attendant difficulties.

One way the problem has struck me is that we have been listening to bells ringing in engine cylinders for many years. Of course, there are as many kinds of bells and bell tones as there are engines and combustion chambers. It may be that if we had a cracked combustion chamber, we couldn't ring the bell—couldn't hear it.

In other words, many of these engines which have high anti-detonating quality have combustion chambers that are of a self-damping nature, that is, sleeves fitting over each other, etc.

1918 Ricardo Designed Head Used by Delage in 1913

By W. F. Bradley
European Correspondent
AUTOMOTIVE INDUSTRIES

IN regard to articles by Alex Taub, there was a sketch presented, AUTOMOTIVE INDUSTRIES, Aug. 1, Fig. 8, of a cylinder head said to have been designed by Ricardo in 1918.

The racing engines built by Louis Delage in 1913, for the French Grand Prix limited fuel race, used that type of combustion chamber. In 1914, the writer brought two of these Delage cars to Indianapolis. One car, driven by René Thomas, finished first while the other, driven by the late Albert Guyot, came in third. The winning car was sold in the United States, and the other racer was brought back to France but was never raced again. Delage, who had employed another chief engineer, dropped this design for a hemispheric combustion chamber with positively closed valves. A minor defect in the valve closing gear caused them to lose the only European race in which the car was entered.

Control Shock for High Compression

By Robert N. Janeway
Head, Dynamics Research Dept.
Chrysler Corp.

AS I see it, there are two aspects to the problem of further increasing compression ratio and both of them are economic, in the final analysis. The first has been thoroughly explored by Mr. Taub, namely, the increased investment and production cost involved in every increment of octane number added to the base fuel. Although I have always been skeptical of the perennial cry of waning petroleum reserves, the fact remains that huge sums are already being spent to perfect the recovery of gasoline from natural gas, coal and shale oil. We must face the possibility that reducing yields of gasoline may be very definitely a trend in the wrong direction.

In contrast, any gain that can be made by combustion chamber design in an existing engine as a rule adds nothing to the production cost and is literally a gift of nature. In my opinion, the possibilities for improvement in present engines are very far from

being exhausted. It is true that the largest anti-detonation gains in the past have been made relatively easily by application of the so-called "quench space," in effect, localized cooling of the last gas to burn by high surface to volume ratio. Future gains may come harder but are bound to yield to imagination and thermal fundamentals.

The second aspect is the little recognized and even less understood limitation to compression ratio introduced by combustion shock. This is simply the dynamic effect of the rapid pressure development, and arises from the fact that the load carrying parts of the engine have mass and elastic deflection. The maximum limit of shock would be the condition of instantaneous burning and application of maximum pressure. This would produce a dynamic deflection just twice what it would be if the pressure were slowly applied. A very close analogy is the case of a weight applied to a free spring and suddenly released. Here, as in the engine, it is the lag of the restoring force of the spring behind the applied load that produces acceleration and velocity of the deflecting mass. This velocity can only be dissipated by the excess deflection which permits the restoring force to surpass the applied force and thus produce deceleration of the moving mass.

The shock deflection in the engine is essentially produced by the acceleration in the rate of pressure rise and is only secondarily affected by the maximum rate of pressure rise. For, due to its inertia, the deflecting mass cannot keep pace with the increasing load. As it lags behind, a force differential is produced which accelerates the mass. The greater the acceleration in the rate of pressure rise the greater is the lag, and the higher the eventual velocity of the deflecting mass. As in the analogous case of the falling weight, the kinetic

(*Turn to page* 70, *please*)

New Developments at National

Boat Show

THE 40th Annual National Boat Show, held in New York City, Jan. 6 to 14, established a new record with more than 240 separate exhibitors. The number of boats on display, 181, also was at an all-time high.

Among the new developments were reverse gears or neutral devices as features of almost every make of outboard motor. Separate fuel tanks also were shown in increasing numbers. A fluid clutch was displayed and demonstrated by one outboard motor maker.

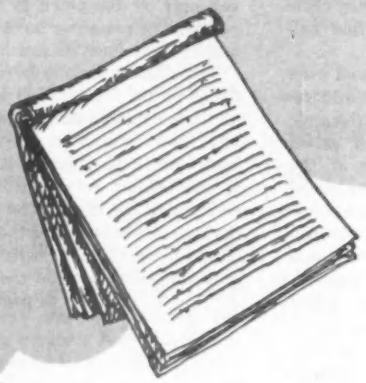
Although fewer radical changes were made in the inboard engines, in general they were improved and refined for still better performance and economy. Universal Motor Co. displayed its recently-introduced Blue Jacket Flexi-four, a four cyl engine which develops 45 hp. A new six-cyl 522 cu in. Diesel with a front end power takeoff was shown by the Harnischfeger Corp. Among the 17 engines in the booth of the Gray Marine Motor Co. was a new model of the Super Six-330 which develops 155 hp at 3400 rpm. Cummins Engine Co. has brought out three new Diesels, the NVHS-1200, a 12-cyl supercharged engine which develops 550 hp at 2100 rpm, the NVHMR-1200 rated at 264 hp for heavy duty service at 1800 rpm, and the NHRMS-600 with a maximum rating of 300 hp at 2100 rpm. Detroit Diesel Division of General Motors Corp. featured a Quad 6 multiple Diesel engine unit equipped with two-stage centrifugal pumps for fire boat use.

A number of new outboard models were introduced at the show. Evinrude Motors displayed the Fleetwin, a 7.5 hp unit equipped with a clutch on its drive shaft, and the Fastwin, a 14-hp model which has a forward-neutral-reverse arrangement in the gearcase. Fuel for the Fastwin is carried in a separate six-gallon tank. Johnson Motors has added a neutral clutch to its Model TN five-hp motor. In addition to the clutch, the new Model TN includes a shock absorber on the drive shaft to eliminate shear pin breakage. Two new motors were displayed by Martin Motors, the Commando, a 10-hp, 57-lb twin and the Hi-Speed 60, an 11 cu in. unit.

All of the Neptune motors exhibited by Muncie Gear Wks., Inc., were fitted with neutral clutches. These clutches are of the spring-loaded, multiple disk type and are located in the propeller hub. A new 16-hp alternate-firing twin with separate five gallon fuel tank and a forward-neutral-reverse gear arrangement was displayed by Scott-Atwater Mfg. Co. It has a built-in fuel pump, eliminating the need for pressure in the fuel tank. Light weight is a feature of Metal Products Corporation's new six-hp Flambeau alternate-firing twin. It weighs only 32 lb.

Champion Motors Co. demonstrated two of its motors equipped with fluid clutches. Known as the Hydro-drive, Champion's clutch permits controlled slippage, neutral, or direct drive with control by means of a lever located at the right side of the engine. Its small size permits the Hydro-drive to be located in a gearcase of normal size.

SAE's



By James R. Custer

THE 45th annual convention of the Society of Automotive Engineers came to a successful end Jan. 13 in Detroit after five days of a heavily-scheduled program of technical, business, and committee meetings. Total attendance for the week set a new record for SAE meetings, with more than 3600 engineers and allied specialists registered at the meetings.

In addition, the annual dinner gathering at mid-week, featuring a speech by General J. Lawton Collins, and a concert by the General Motors Chorus, with Robert L. Biggers, president of the Fargo Division, Chrysler Corp., as master of ceremonies, was attended by over 2400 SAE members and guests. James C. Zeder, chairman of the engineering board of the Chrysler Corp., was inducted as SAE president for 1950, succeeding S. W. Sparrow, Studebaker vice-president in charge of engineering. The big engineering display, at which 54 companies exhibited their latest automotive products, attracted hundreds of engineers.

General Collins, Chief of Staff, United States Army, advocated the same cooperation by the Armed Services and industry in peacetime as during war, and dis-

Studebaker Automatic Transmission

By H. E. Churchill,
Studebaker Corp.

THE contributions of automatic transmissions to simplicity of driving technique and therefore safety of traffic and highway operation are not achieved without some reductions in power available to drive the car and this transmission is no exception. All hydraulically controlled designs to date employ pumps for actuation and these consume power whenever the engine or car is running. The horsepower required to drive the front and rear pumps and the converter cooling fan of this design during full throttle operation in drive range are shown in Fig. 1. These data are self-explanatory and detract from the total power available to drive the car. Their influence on performance is of course relatively small and dependent upon car speed.

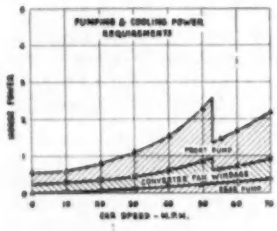


Figure 1

Spinning power losses of the direct drive clutch are essentially proportional to the fifth power of the diameter. These losses are only incurred in intermediate, low, and reverse gears of this design. Fig. 2 shows a comparison of clutch drag torque for the diameters indicated and though these drag torques reach sizable proportions at high speed differentials they are a very small percentage of total input torque at the car speed ranges in geared operation where they occur. These losses are minimized by reducing circulation of oil through the chamber in which the driven member spins. The spin losses and their attendant slight reduction in geared performance are more than offset by the gain in fuel economy achieved by eliminating slip losses through application of the clutch in direct drive. Fig. 3 shows the spin losses of the 9½ in. diameter production clutch as percentage of total input torque for various car speeds. It will be observed that this loss amounts to approximately 2 per cent at stall, reaches a minimum of 0.6 per cent at 30 mph, and 1.5 per

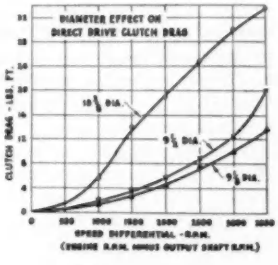

DIAMETER EFFECT ON DIRECT DRIVE CLUTCH DRAG
CLUTCH DRAG - LBS. FT.
10½ DIA.
9½ DIA.
9 DIA.
SPEED DIFFERENTIAL - R.P.M.
(ENGINE R.P.M. MINUS OUTPUT SHAFT R.P.M.)

Figure 2

Largest Meeting

cussed the Army's problems in developing superior equipment—vehicles, tanks, tactical aircraft, rockets, recoilless guns, and other weapons. A lightweight tank is ready for production while medium and heavy tanks are in the prototype stage. Rebuilding of war vehicles and other equipment is progressing on a huge scale overseas and in this country, General Collins stated, with 60,000 general purpose Army and Air Force vehicles to be rebuilt in Japan, many coming from islands in the Pacific. At the present time they are being processed at the rate of 1000 per month. In Germany a similar program resulted in the rebuilding of 38,000 vehicles.

During an interview Raymond Loewy, industrial stylist, forecast the "hard top" type of design as the ultimate for closed bodies and that doors will be extended into the roof when the weather sealing problems are solved, since both changes provide greater headroom. He emphasized the importance of reliefs on the sides of a car to give it a dynamic appearance.

The Horning Memorial Medal was presented to T. A. Boyd, General Motors Research Laboratories consultant, in recognition of his distinguished service for many years in the mutual adaptation of fuels and engines. Having collaborated with Charles F. Kettering and the late Thomas Midgley, Jr., in the discovery of tetraethyl lead as an antiknock compound for automobile and aviation gasolines, his Horning Memorial Lecture gave a comprehensive review of the fuel-engine research during the past 30 years, urging a vigorous continuation of this research.

The technical session on automatic transmissions, featuring papers and discussions on the new Studebaker and Chevrolet units, proved to be the big attraction with the large ballroom and its balcony jammed to the doors. During the week 41 papers were presented at 22 technical sessions, many of which were devoted to engine developments, always a good interest producer. Important extracts from as many papers as space permits are presented here.

cent at the full throttle upshift from intermediate to direct at 58 mph.

(A description of the Studebaker automatic transmission was published in the Dec. 15, 1949, issue of AUTOMOTIVE INDUSTRIES—Ed.)

Chevrolet Automatic Transmission

By R. S. Plexico
and R. E. Kaufman,
Chevrolet Motor Div., General Motors

THE converter is made almost entirely of steel stampings. This type of construction was chosen as being the most practical method for large production. The tooling and manufacture of these units have taxed the ingenuity of many of the best stamping men in the industry. The utmost is required in the accuracy of dies and their upkeep, checking fixtures, and the gage and hardness of the steel from which the parts are made in order to produce satisfactory vaned members.

The pump and turbine are quite similar in make-up, although none of the pieces are identical. The vanes are first spot welded to the torus ring while held in a fixture that locates them in accurate relation. The sub-assembly is then pressed into the outer shell, into which it fits very accurately and the light squeeze fit holds it in place. Vanes fit very closely at both ends and have zero to 0.006 in. clearance at the middle portions to insure secure brazing at the ends. The over-run fluid member vanes are assembled into their respective inner and outer rings and their retaining tabs staked securely. This sub-assembly is then pressed with an accurately held push fit into the torus ring of the pump or turbine. Hub flanges are located by pilot flanges on the outer shells which are later machined off. A welding flange is pressed on the OD of the primary pump.

Copper powder in solution of proper viscosity to cause the desired amount to adhere, is then sprayed through the vaned openings and around the hub and welding flanges. The assembly is placed on a stand having carbon supports that fit into the inner ring of the over run fluid coupling section so that the outer shell and all parts within it are held in contact by their own weight as they pass through the brazing furnace. Excess copper drains out the open ends of the inner and outer shells and any accumulation is removed when the edges of the shells are machined. Vanes are set accurately in position and machining is registered with their ends and the diameter of the outer shell accurately enough to eliminate the necessity of finishing the ends of vanes. Vanes are made of 0.025 in. stock.

The pump and turbine sub-assemblies are restruck after brazing to reduce distortions which may occur during

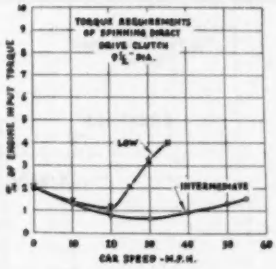


Figure 3

brazing. The center portion of the outer shell, which pilots the hub flange in place during brazing, is machined away. The primary pump vane and shell subassembly is spot welded to the interior of the converter housing by the welding flange at the front and hub flange at the rear. The turbine hub flange is bushed to run on a hub bolted to the converter cover and has a splined hub bolted to it for driving the transmission input shaft. The primary pump hub, a larger and more elaborate part made of a steel forging, is attached to the converter housing subassembly by machine screws and sealed with a synthetic "O" ring near its outer diameter. It is bushed to pilot the converter on the stator sleeve extending forward from the transmission. This hub contains jaws for driving the front oil pump, it carries the secondary pump on its forward end and it fits into the oil seal at the rear.

The stators and secondary pump are made of "Z" shaped vanes having flanges that extend from one vane to the next, spot welded to inner and outer rings. The rings provide the vortex path with suitable labyrinths to reduce oil leakage at the gaps between members, and are slightly bell-mouthed at the entrance ends to reduce shock losses due to mis-match and runout of adjacent members. Hub rings are pressed in place, copper powder solution sprayed on and the parts run through a brazing furnace. The hub rings are then bored and faced and the outer ring edges machined to width, after which the over-run clutch cams are shrunk into the assembly. The hub rings are securely staked into notches in the over run clutch cams for retention and drive.

(A description of the Chevrolet automatic transmission was presented in the Jan. 1 issue of AUTOMOTIVE INDUSTRIES).

High Altitude Aircraft Oil Systems

By F. E. Carroll, Jr.,
Power Plant Laboratory,
Air Materiel Command

THE closed circuit (Fig. 4) and hot tank (Fig. 5) aircraft oil systems both provide improved high altitude performance over the conventional oil system. The air-oil percentage is consistently low for the hot tank system. However, oil aeration in the closed circuit system decreases rapidly with increasing altitude until at 40,000 ft the air percentage in each system is essentially equal. For aircraft using hydromatic propellers, the closed circuit system provides a constant propeller governor oil flow, regardless of altitude in an R-3350 engine oil system. The closed circuit system, therefore, due to the satisfactory high altitude performance characteristics and simplicity of design which requires no additional power, is the most desirable oil system for use in high altitude operational aircraft.

The approximate ratio of the R-3350-57 pressure pump to scavenge pump capacities is 1 to 2 while that of the Pratt & Whitney R-4360-B engine pump capacities is 1 to 3. Since oil aeration caused by excess scavenge pump capacities may affect the engine pump delivery with the increased capacity ratio, an investigation of the performance of the closed circuit system and the hot tank system with an R-4360-B engine will be conducted in the near future on a laboratory set-up where oil system altitudes of 55,000 ft can be attained. Flight tests will probably be conducted following an analysis of the laboratory test results.

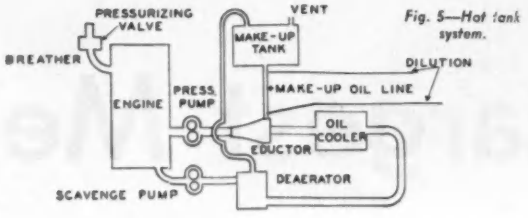


Fig. 5—Hot tank system.

A closed circuit oil system has been flight tested in a B-29 aircraft and the data recorded have essentially verified the results obtained from the laboratory tests. However, the test results obtained from the system in the B-29 when subjected to extreme cold temperatures at the Cold Hangar, Eglin Air Force Base, indicate that the method of injecting fuel into the system must be changed and an oil tank redesign is necessary. The system as tested included an oil bleed immediately downstream from the deaerator, which bleed line ran to the make-up tank in order to aid tank warm-up. Work is now progressing satisfactorily toward obtaining a tank design which will warm-up in a minimum of time in order that make-up oil will be available when required. For turbo-jet engine oil systems, however, there is no cold weather problem since AN-0-9 Grade 1010 oil (—70 F pour point) or even a lower viscosity oil is used.

Since it has been determined that the reciprocating engine oil system deaerator design criteria are not applicable to a turbo-jet engine oil system, the Power Plant Laboratory, AMC, has initiated a development contract to conduct a similar turbo-jet engine oil system investigation of deaerator and eductor design. The goal is to obtain design criteria which can be used as a basis for the fabrication of components that will provide satisfactory high altitude performance (50,000 ft minimum) in the closed circuit oil system on turbo-jet aircraft.

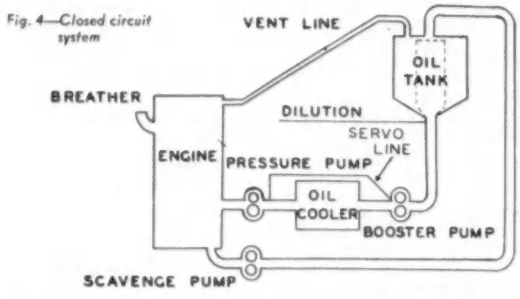


Fig. 4—Closed circuit system

Full Vacuum Controlled Ignition Systems

By C. W. Rainey,
Ford Motor Co.

THE full vacuum ignition control system does not employ the use of centrifugal weights or manifold vacuum applied directly to the distributor. Considerable mechanical simplification has resulted in this distributor design. A single spark advance actuating force is used at the distributor in the form of a vacuum diaphragm controlling the breaker plate position. This diaphragm is actuated by a controlled differential vacuum derived in the carburetor

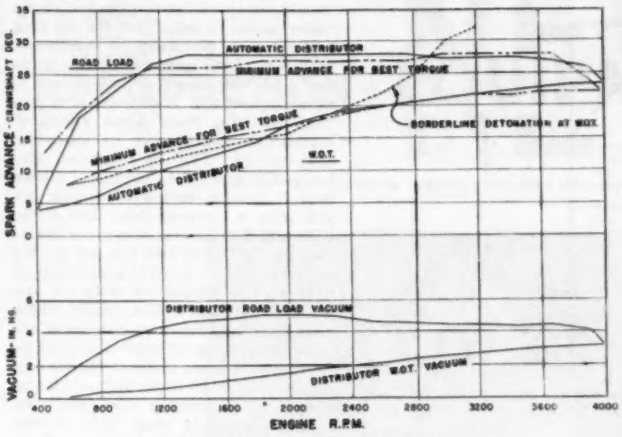


Fig. 6—(See Full Vacuum Controlled Ignition)

Differential vacuums and resultant spark advance for full load and road load engine operation obtained from dynamometer operation of a typical L-head engine. Also shown is minimum spark advance for best torque obtained by manual distributor operation as well as borderline detonation at full power operation.

through the use of specially drilled orifices which are interconnected in the carburetor body. The relationship of the vacuums produced for various speeds and loads are determined by the size and placement of these orifices in the carburetor so that the differential vacuums produced will be a function of engine speed and load conditions. It is, therefore, necessary that the carburetor be engineered for a specific type of engine so as to meet the requirements of that engine.

Full vacuum control of ignition timing represents the following advantages: (1) Simplification of assembly details of the distributor system. (2) Elimination of centrifugal weight spark advance mechanisms. (3) Longer life of wearing parts. (4) Employment of a single spark advance mechanism within the distributor. (5) Establishment of a definite relationship of full and part load differential vacuums within the carburetor. (6) Simplification of service re-adjustment procedures. (7) Fewer parts in assembly to be reworked if service overhaul is necessary of the distributor. (8) Unaffected by torsional vibration causing spark timing spread through elimination of centrifugal weight assemblies.

There are several possible disadvantages in the application of this system which must be taken into account in its application. (1) De-acceleration with closed throttle plate position fully retards the spark to the initial engine timing. (2) The distributor rotor position is fixed in its relationship to the distributor driving shaft and rotor sparking to terminal housing post varies throughout the entire timing range. (3) Additional vacuum passages must be introduced into the carburetor design to supply the differential distributor vacuums.

This design has been under development for the past five years and has been used on production vehicles for the past twenty months.

Mixture Distribution in a Modern Multi-Cylinder Engine

By R. W. Donahue
and R. H. Kent,
Sun Oil Co.

Most of the work reported was carried out on one multicylinder engine, and any conclusions that are drawn must be tempered by this fact. The work on this engine does, however, indicate that the mixture distribution problem is still very much alive; and that maldistribution, at least in some present-day engines, is more or less comparable with that reported for the engine of 10 to 15 years ago. Certain design factors affecting the intermixing of air and fuel in the induction system are of major importance in the distribution of air and fuel to the individual cylinders of the engine. Such design features as the position of the choke valve and its mounting, or any other obstruction in the air passage,

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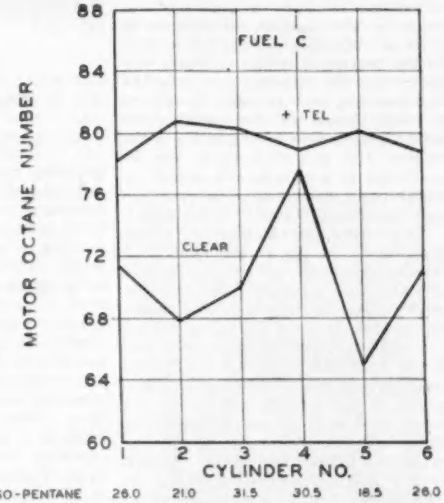
Figure 7



ISO-PENTANE	26.0	21.0	31.5	30.5	18.5	26.0
TRIPTANE	34.0	33.5	30.3	32.5	31.5	34.5
n-HEPTANE	21.8	24.0	26.8	27.0	26.0	23.0
DECALIN	18.2	21.5	11.4	10.0	24.0	16.5
TEL ML/GAL	0.63	1.55	0.94	0.78	1.78	0.78

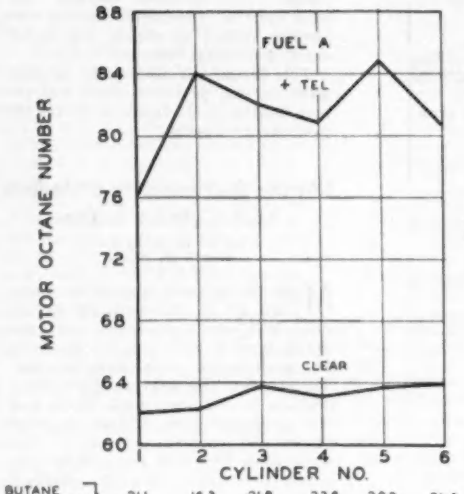


Figure 8

BUTANE	21.1	16.3	21.8	23.6	20.9	21.4
ISO-PENTANE						
N-HEPTANE	47.4	38.1	43.2	44.6	40.6	46.1
ISO-OCTANE						
CUMENE	17.1	22.0	18.0	18.0	19.5	18.5
DECALIN	14.4	23.6	17.0	15.8	19.0	14.0
TEL ML/GAL	0.88	2.86	2.17	1.93	3.03	1.68

altered the quantitative mixture distribution patterns of the particular engine studied significantly more than reasonably large changes in engine speed, mixture temperature, or fuel volatility. Contrary to some previous thinking, the lightest components of fuels are unevenly distributed, as well as the heavier materials. In also was shown that the antiknock quality of the fuel reaching each cylinder depends to a large extent on the variation in octane quality with boiling range of the original fuel and this quality can be controlled to a considerable extent by maintaining even quality between the light and heavy fractions of the fuel.

To illustrate the effect of the various components on the octane quality of the fuel reaching each cylinder and to indicate the extent to which that quality may be controlled, a comparison is made between Fuel A and Fuel C. In Fuel C, low quality decalin was in the heavy fraction, and the lighter fraction, with the exception of heptane, contained high quality components. As shown in Fig. 7. Fuel C containing tetraethyllead results in much less variation, ranging in octane quality from 78.3 in cylinder No. 1 to 80.8 in cylinder No. 2. The addition of tetraethyllead to Fuel C in effect reduces the difference in quality between the high and heavy fractions, since tetraethyllead is apparently distributed with the high boiling decalin.

In Fuel A the high and low octane quality hydrocarbons are almost balanced. Fig. 8 shows that the addition of tetraethyllead to this fuel has the effect of upsetting the balance between the fractions and results in uneven distribution of octane quality to the cylinders.

Piston Ring Wear

By A. M. Brenneke,
Perfect Circle Corp.

DESIGN and application of piston rings in Diesel engines for maximum scuff resistance conform generally to the same rules as design for abrasive and corrosive wear. Selection of ring width is one exception. Wide widths of top compression rings are desirable from the standpoint of abrasive wear resistance while narrow widths are desirable for scuff resistance. This complication is circumvented in some cases by cutting grooves in the ring face to interrupt the continuity of metallic surface. The grooves are filled with a mixture of black magnetic iron oxide (Ferrox) bonded with sodium silicate. Scuff resistance of this type of ring in ¼ in. width is comparable with that of 3/32 in. width rings. The same principle is applied to chrome plated rings when extreme scuff resistance is required.

Locating the top ring on the piston is an important consideration as regards scuffing tendencies. When the piston is at the top of the stroke the top ring should not travel beyond the end of the water jacket in order that the top ring will not have to operate in excessively hot areas of the cylinder. Locating the top ring well down on the piston is advantageous too. A wide top land protects the ring from direct effects of combustion and reduces its operating temperature. The top ring must also be well supported by a strong second land if it is to do a good sealing job and enjoy a low wear rate. For a rule of thumb 0.20 per in. of cylinder diameter for top lands and 0.05 per in. for second lands will provide adequate land widths. Distribution of space on any piston is always a compromise which must be made for each individual engine. During recent years the trend to fewer compression rings in Diesels has somewhat simplified the matter. Many Diesels are performing excellently with three compression rings and several have been very satisfactorily sealed experimentally, with only two compression rings. Another space saving device on which several engine builders are doing considerable work currently consists of using two oil rings in a common groove. Experimental results have been excellent, although not enough test time has been accumulated by any of those working on the arrangement to make any predictions as to durability.

Fatigue of Aircraft Engine Mounting Components

By R. C. Henshaw,
L. Wallerstein, Jr.,
and S. J. Zand,
Lord Manufacturing Co.

BY adhering to certain design principles and metallurgical considerations, superior endurance life can be obtained on highly stressed aluminum alloy aircraft components. As an example, the metal parts of the flexible engine suspension for the Pratt & Whitney R-4360, 28 cylinder radial 3500 hp engine are chosen. To house the elastic core on the original suspension, components made of steel were used weighing about 134 lb per engine, or 536 lb for a four-engined airplane. Considerable experience with engine suspensions made for other power plants using forged aluminum alloys indicated that a substantial weight reduction could be accomplished by employing previously acquired techniques and redesigning this heavy mounting system. Calculations showed that a suspension could be produced weighing in the neighborhood of 75 lb (final product weight was 71.5 lb), thereby saving, in the case of a four-engine airplane, 236 lb; a remarkable lightening, equivalent to the weight of one crew member with baggage or almost 800 rounds of .50 calibre ammounition.

Anodic films prepared in sulphuric

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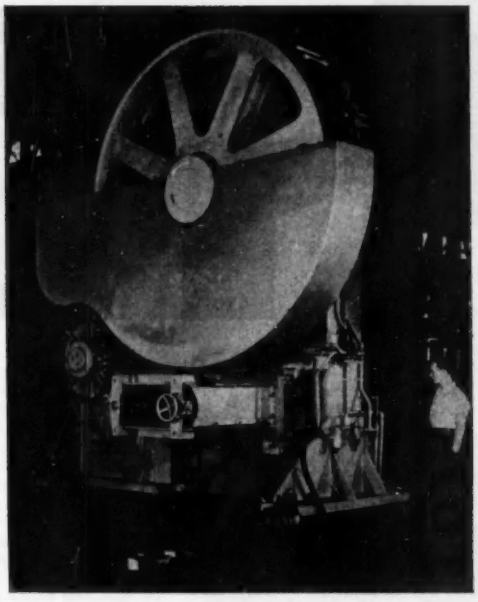


Bethlehem 700-ton billet shear

J-16—700-Ton Billet Shear

Built by the Bethlehem, Pa., plant of Bethlehem Steel Co. for a major automobile manufacturer, a 700-ton billet shear has a special retracting gage. This hinged gage, shown in lower center of the picture, not only swings out of the way so that workmen can get at the shear blade for quick removal, but in operation through synchronization the gage also retracts before the blade cuts, letting the slug drop freely. With the aid of both a long and a short peel, the gage measures either short or long lengths without requiring an awkwardly long gage extending out into the aisle. It permits the cutting of slugs from three to 38 in. long, making adjustments to 0.008 in. The hand wheel (lower center) adjusts the gage, and can be locked in position.

The clamp is pneumatically operated and locked and its movement synchronized with the motion of the shear blade.

Maximum accuracy in cutting is achieved by an air-cushioned gage which cushions the stopping of the moving billet and spots it in the correct position, so that the length of slug cut off will always be the same. Also, the shear has wide and adjustable wearing surfaces on its guides, so the correct alignment of the shear blade can be maintained. The blade and billet have to be in the right position for cutting. The blade is V-notched.

There is one gag roll, which is spring-cushioned to raise the billets above the V-notch in the frame after each cut.

The billets are advanced at the rate of about 140 ft per min by a power feed table. At this high speed the billets would inflict a severe impact on the gage, but as the gage is air-cushioned, the effect of the impact is virtually nullified and the correct positioning of the billet is assured by the recoil action against the positive stop. The gag roller rests in spring-cushioned brass bearings.

The air balancing cylinders on top compensate for the weight of the slide, which is connected to the eccentric by the pitman, and which carries the top shear blade. The cushioning tank in the center absorbs the fluctuation.

The bull gear is driven through an intermediate gear by the flywheel shaft.

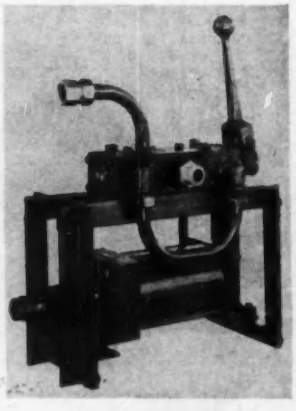
The shear cuts mild steel billets up to 6 in. square and 105,000 tensile steel billets up to 4 in. Two three-in. high tensile steel billets can be cut at once. From the slugs such miscellaneous drop forgings as ring gears, crankshafts and steering knuckles will be made.

On one side of the machine, billets are fed in continuously by an automatic conveyor. They emerge as slugs on the other side, tumbling down a chute. The slugs shown on the floor in the illustration will under everyday working conditions fall into a buggy. The shear will be erected on a foundation several feet above floor level for this purpose.

Shear is 13½ ft high and was built to fit into a specified shop space. It is powered by a V-belt drive on a 100 hp motor and makes 15 strokes per min.

J-17—Lubricant Measuring Device

Measuring device for filling automotive transmissions with lubricant on an assembly line, is designed and manufactured by the J. N. Fauver Co., Inc., Detroit, Mich. The device consists of a four-way operating valve and hydraulic cylinder mounted on a fabricated frame and piped so that when the valve is in the one position, the cylinder



Fauver measuring device

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is operated in one direction measuring a specific volume to the transmission. Then when the valve is reversed, the cylinder is actuated in the other direction, measuring the same amount in another transmission. The amount of lubricant is easily adjustable. A nozzle in which there is a check valve is installed in a connecting hose length to prevent dripping.

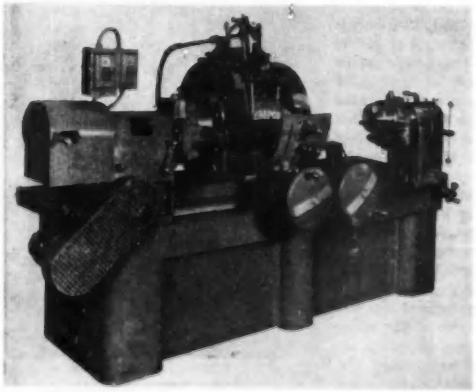
J-18—Crankshaft Grinder

Introduced by Lempco Products, Inc., Bedford, Ohio, a new KG series of crankshaft grinders is said to provide a base design of advanced structural characteristics comprising one complete "weldment." In manufacture, after welding the base is mounted as a unit on a planing machine for sizing. The ways are then completely handscraped to a tolerance of one ten-thousandth of an in. to assure a supporting base capable of maintaining high precision for heaviest grinding operations.

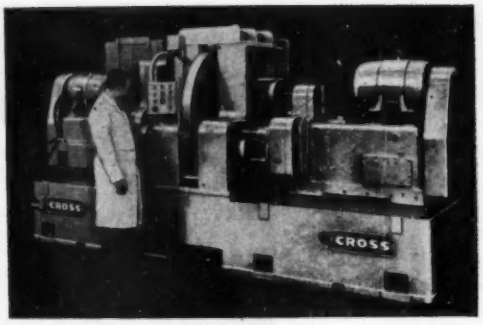
The Lempco KG series consists of three models, the NKG-50, the TKG-48, and the TKG-48A. The NKG-50 has a capacity of 50 in. between chucks, accommodating all passenger car shafts and 90 per cent of truck shafts. The NKG-50 is equipped with 360 deg graduated throwheads and 6 in. chucks.

The Lempco TKG-48, a 14 in. by 48 in. capacity machine, is equipped with center-drive type throwheads. The TKG-48A is the same machine equipped with graduated throwheads and 6 in. chucks, and has a capacity of 14 in. by 42 in.

All models have longitudinal as well as transverse movement of the grinding wheel, which greatly reduces the size and weight of the machines. A cam-action follow rest, which gives 100 per cent support directly opposite the grinding wheel pressure, is also standard equipment. Headstock and tailstock are Timken bearing equipped.



Lempco crankshaft grinder, KG series



Cross special machine tool for machining automotive flywheel.

J-19—Flywheel Machine Tool

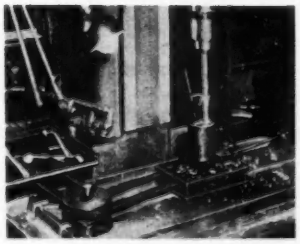
For machining automotive flywheels when using an unskilled operator, a new special machine tool, designed and built by the Cross Co., Detroit, Mich., drills, chamfers and reams flywheels at the rate of 140 pieces per hr at 100 per cent efficiency. It is a 5-station index trunnion type with a fluid motor for indexing.

At station one, the operator loads and unloads; at station two, 16 holes are drilled; at station three, 16 holes are chamfered; at station four, 15 holes are chamfered; at station five, three holes are reamed; the operator merely positions the part in the loading station and presses the cycle button.

To provide flexibility for reasonable part design changes, standard Cross sub-assemblies are used. This also assures minimum down time and low maintenance costs. Other features include hardened and ground ways, and hydraulically operated feed and rapid traverse.

J-20—Safety Device For Work-Holding

Offering a solution for safety in work-holding in the machine shop, a device called Torkarm now being marketed by the Torkarm Corp., Minneap-



Drill press attachment, Torkarm, offered by the Torkarm Corp.

olis, Minn., fastens onto a drill press or vertical tapper of almost any size without requiring a conventional vise, clamp or bracket or the drilling of a hole. Torkarm operates on the same principle as a pantagraph-type drafting machine, holding the work securely yet permitting the operator to move it freely across the work table. The device converts the hazardous torque of a spinning drill, tap or reamer into a useful force which aids in holding the work in place.

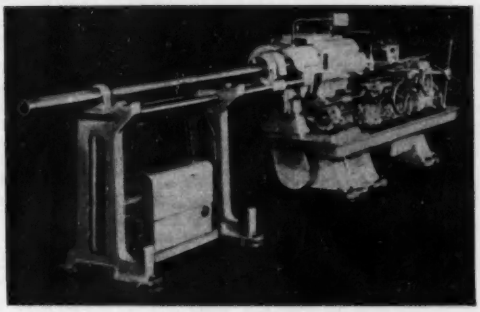
Resultant "free movement torque absorption" attained by Torkarm is due to the action of two pairs of arms, hinged in parallel on fixed centers at both ends and in the middle. The hinging allows free lateral movement. The fixed center arrangement forces the arms to remain parallel, which in turn assures their remaining equal in length regardless of any position they may assume. Since each set of arms is tied and hinged individually at one end to the table and at the other to a "free" work plate, the plate cannot rotate. Thus, the plate remains stationary under torque but moves freely across the horizontal plane of the table in any direction when lateral force is applied as is the case in moving work from center to center under a spindle.

Also developed for use in conjunction with Torkarm is a series of cam locking and hold-down work plates making it possible to quickly drill, tap, or ream practically any shape or size piece, regardless of the hp applied. Tumble jigs can be used on the face of these plates between two pins which completely absorb all of the torque, yet the jig can be tumbled at will and moved from center to center as fast as the jig can be moved across the plate or the plate moved across the drill press or tapper table.

J-21—Bar Feed and Collet Chuck

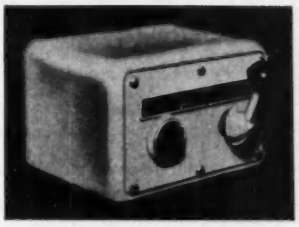
New hydraulic bar feed and collet chuck operating mechanism put out by Jones & Lamson Machine Co., Springfield, Vt., for use with Jones and Lamson universal turret lathes provides a finger tip control of bar feed and chuck which opens the collet, advances the stock any amount up to 30 in., closes the collet, and returns the stock feed chuck. A single lever controls all phases of the operating cycle.

The stock feed carrier has a 4-jaw scroll type chuck mounted on anti-friction bearings. Two of the jaws are equipped with eccentric cams that allow the chuck to grip the stock firmly on the forward stroke, and to strip back easily. The other two jaws are provided with adjustable top jaws so that either round, square or hexagon stock can be held without changing jaws. The stock feed carrier is mounted on 2-in. diam steel support bars.



Jones & Lamson ram type universal turret lathe equipped with hydraulic bar feed and collet chuck

A side loading feature conserves floor space at the headstock end of the machine. With this the spindle end of the silent tube can be removed from the housing of the stock feed chuck and swiveled outward. Then stock can be loaded from the front.



Control panel for Jones & Lamson hydraulically operated bar feed and collet chuck

When long bars are to be turned at high spindle speeds an auxiliary feed chuck should be used. For long small diam bars a silent tube for use with both feed chucks is recommended. The heavy duty silent tube with non-metallic lining eliminates whip and objectionable noise.

Stock supports are wide-spaced gray iron castings. These can be leveled and lagged to the floor. A self-contained hydraulic unit with motor driven pump and solenoid operated valves is mounted on a channel iron connecting the bases of the supports.

J-22—Combination Welding Aids

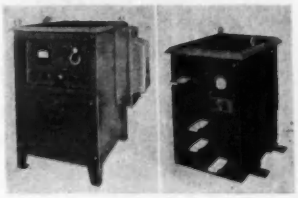
Electric Arc, Inc., Newark, N. J., makes available their latest combination for pre-heating before welding and stress relieving after welding the new 40 KVA model RTA regulating unit and the 40 KVA model AC3 low frequency induction heating unit by the Smith-Dolan system.

This combination is for use in limited space where the extreme flexibility of Electric Arc's smallest induction heater is not needed. By this is meant their 10 KVA model UP, which can be stacked in 10 KVA units to achieve 20 KVA capacity, 30 KVA capacity, etc. The RTA regulating unit is arranged for operation on 220/440 and 550 volts at commercial frequencies. The AC3 heating unit is small enough to be placed near the work with ready accessibility.

With models RTA and AC3 more equipment can be added as required. On larger jobs the model AC3 unit can also be used as a booster unit with the other Smith-Dolan heating equipment.

Automatic control cabinets made by Electric Arc, Inc., can be used with the model RTA regulating unit.

Dimensions of the RTA regulating unit are 20¼ in. wide, 31 in. deep, 29¾ in. high, and approximately 620 lbs in weight. Dimensions of the AC3 heating unit are 35 in. wide, 32 in. deep, 46⅛ in. high, and approximately 815 lbs in weight.



Electric Arc 40 KVA Model RTA regulating unit and 40 KVA Model AC3 low frequency induction heating unit.

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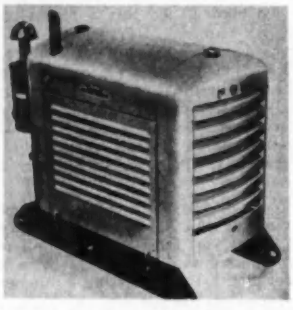
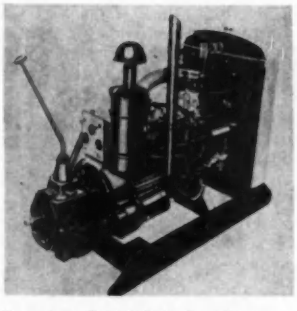
K-26—Industrial Engine Power Units

Ford industrial power units in a complete new line are in production at Ford Motor Co. industrial engine department, Dearborn, Mich.

Five models are included in the line and are available in either open or enclosed versions. They will be offered complete with radiator, instrument panel and S.A.E. or Ford type housings, and will be equipped with skid type mountings. The units may be ordered with or without clutch, power take-off and three, four or five-speed transmissions. Each unit, either open or closed, will be thoroughly tested in manufacturing and will be ready to run immediately upon installation.



Enclosed type Ford industrial power unit available for the first time with radiator, instrument panel and S.A.E. or Ford type housings.



Open type Ford industrial engine power unit available for the first time with radiator, instrument panel and S.A.E. or Ford type housings.

The industrial engine power unit line includes two six-cylinder models, two V-type eight-cylinder models and one of four cylinders. Piston displacement of the four-cylinder unit is 120 cu in., 226 and 254 cu in. in the six-cylinder models; and 239 and 337 cu in. in the eight-cylinder models.

K-27—Air-Over-Hydraulic Brake Unit

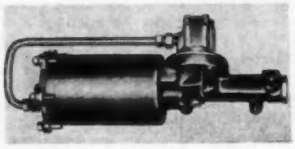
Adopted by certain truck manufacturers as standard equipment, a new air-over-hydraulic brake announced by the Midland Steel Products Co. (power brake division) of Detroit and Cleveland combines three time tested air and hydraulic brake units into a single device, making it possible to install air-over-hydraulic brakes in simplified form. This single unit can be located at any available place on the chassis without dismounting or moving the master cylinder. Air Hy-power mounting brackets are not subjected to any braking forces and need only to hold the unit securely in place.

Midland's Air Hy-Power is designed so that no mud, water, dust or dirt can enter to corrode, rust or unseat internal valves.

Air Hy-Power eliminates the air brake foot or treadle valve and bracket, connecting linkage and installation cost. It is not necessary to relocate the master cylinder in the changeover to air hydraulic but rather merely to interpose the Air Hy-Power unit between the master cylinder and the wheel cylinders and re-connect to hydralic lines.

Air Hy-Power eliminates the brake chamber or air cylinder, the bracket, assembly of master cylinder to bracket and its mounting on frame. Installation time is reduced because of less tubing required and simpler mounting detail.

Fine graduation and brake "feel" is provided by Air Hy-Power similar to the brake "feel" provided in passenger car brakes. With this unit pedal follow-up is maintained and indicates when brakes need adjusting. Also the hydraulic braking system is not affected by installation of this power brake.



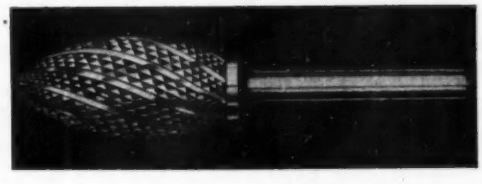
Midland air-over-hydraulic brake

K-28—Diamond Cut Carbide Burs

The relatively new diamond-cut design of Keller carbide burs, called Di-Burs, put out by Pratt & Whitney, Division of Niles-Bement-Pond Co., West Hartford, Conn., has been further improved by deepening the flutes at specified intervals.

In the efficient removal of excess metal when shaping and finishing all kinds of materials—particularly the tough steels used in producing modern dies and molds, the new design is declared to provide the operator with better control, especially in nose-cutting.

P&W Di-Burs are master ground from accurate forms on special machines to prevent the formation of minute "flats" responsible for producing annoying needle-like slivers from die steels. This exclusive method of manufacture forms the sharp, diamond-shaped points characteristic of Di-Burs, and correctly staggers them in proper sequence to make fine granular chips harmless to operators' hands. Grinding the flutes in solid blanks from the shank end makes them run true with



Pratt & Whitney improved design of Keller carbide burs

NOW...

Write for

Bulletin 49-55

This new bulletin has 28 pages of useful hydraulic cylinder information such as installation data, design features, technical data, etc.

Vickers now offers a very extensive line of oil hydraulic cylinders . . . cylinders that have important improvements. Vickers Cylinders are of modern design . . . as advanced as the Vickers Pumps and Controls with which they will be used to provide better hydraulic systems. There are 12 standard bore sizes ranging from 1" to 8", and 12 standard mountings with innumerable combinations. For complete information, ask for Bulletin 49-55.

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NEW PRODUCTS

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the shank, without the "hop" or "jump" so damaging to carbide. Keller Carbide Di-Burs are made in all regular shapes and sizes, and in fine, standard and coarse-cutting grades.

K-29—Ruggedized Panel Instruments

The Marion Electrical Instrument Co. of Manchester, N. H., comes forward with a new family of panel instruments—the ruggedized line, sponsored by the Signal Corps Engineering

Marion panel instrument in the Ruggedized line

Laboratories, to meet performance requirements of high shock testing with the instruments mounted firmly to panels and subjected to 2,000 ft lb blows in each of three orientations with respect to direction of applied blow; extremely severe vibration for six-hour periods; and tumble testing in a large compartmented tumbling barrel for one hour.

This performance has been attained with a completely new internally shock mounted D'Arsonval type of movement which has had its mass sharply reduced and designed to provide improved electrical accuracy and performance as well as resistance to these most severe abuse requirements.

A newly developed shock mount attenuates high amplitude, low frequency shock forces. Revised frame structure secures the core against shock failure. New fastening techniques and materials prevent magnet fracture, increase shear resistance and minimize whipping and collision between dial and pointer assembly under shock and vibration. New hair springs reduce zero shift, raise fatigue point, and eliminate deformation under shock. Extremely high torque-to-weight ratios permit larger radius pivots, reduce the unit loading of the bearings and permit them to withstand much greater shock and vibration without damage.

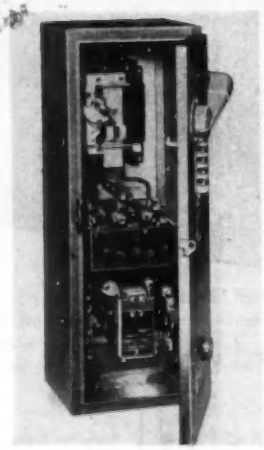
Laminated aluminum alloy tubing pointer with a positive lock on the balance cross of the moving system withstands extreme shock and vibration and permits greater electrical overloads without pointer damage. New shock mounting ring distributes forces set up under high shock. Hermetic sealing gives complete weather protection in any climate. And there is an appreciably reduced overall weight.

These instruments afford to the instrument user and equipment designer a new freedom of application permitting use of electrical instruments in fields previously limited by the essential fragility of electrical instruments, the company claims.

K-30—Breaker Type Combination Starter

A circuit breaker type combination starter for 1 to 100 hp polyphase motors, announced by Square D Co., Milwaukee, Wis., provides both increased operator safety and simplified installation and maintenance.

Safetywise, a new circuit breaker

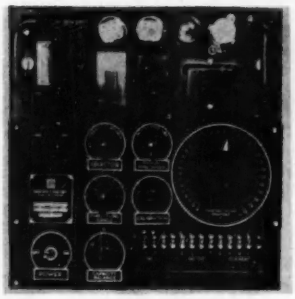


Square D circuit breaker type combination starter

operating mechanism having an interlock prevents opening the door when the breaker is "on." An authorized person, however, can release the interlock for inspection without power interruption. When the door is re-closed, a self aligning handle indicates true position of the breaker. The operating handle can be locked "on" or "off" with one, two, three or four padlocks of varying sizes. The handle locking mechanism also locks the door. This mechanism is also available on control centers, and as a separate item for other uses with Square D breakers. The thermal-(coilless) magnetic circuit breaker is non-tamperable, gives repeat protection, and can be quickly reset.

The magnetic starter provides straight-line, guided vertical motion of the armature and movable contact assembly to eliminate bearing and reduce wear. Mounting and wiring conform to new NEMA standards.

K-31—Electronic Control

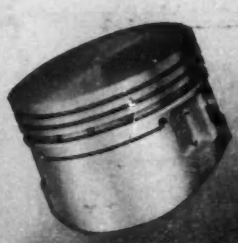


Honeywell electronic control, No. 077

A highly accurate and low-cost electronic control instrument that for industrial applications is sensitive to temperature changes as small as one-tenth of one degree has been developed by Minneapolis-Honeywell Regulator Co., Phila., Pa.

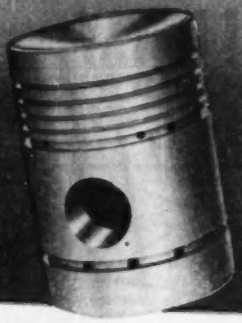
The device, known as No. 077, will control industrial processing temperatures in which the temperature range is between 20 deg below zero and 300 deg above. It is said to be immune to vibration, dust and dampness and, where both control and a record are required, may be used with indicating or recording instruments made by Honeywell's Brown Instruments division.

This new electronic model operates on the principle that resistance of a wire-wound sensing element varies in proporation to the temperature of the control medium. The sensing element forms one leg of a Wheatstone bridge circuit so that any minute change in temperature causes the bridge to become unbalanced and permits current to flow. Electrical unbalance of the bridge is imposed on an electronic amplifier which amplifies and detects the



Air Craft

Nelson Auto-Thermic



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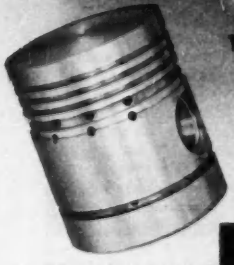

Trunk Type

STERLING ALUMINUM PRODUCTS INC.

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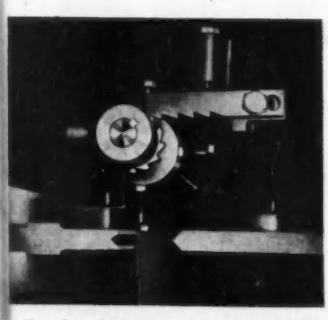
direction of unbalance to operate either of two output relays, according to the direction of temperature change. The two relays control a motor.

K-32—Automatic Gage For Press Brakes

An automatic gage for press brakes, the Humphrey Rodex, offered by General Gas Light Co., Kalamazoo, Mich., is of the self-indexing rotary type and permits producing as many as four different bends in a piece of metal before it leaves the operator's hands.

The gage consists of a rack and gear assembly which automatically rotates adjustable gage stops into position and holds them securely until the bend has been made. The rack, which is attached directly to the punch, engages the gears and on the upstroke brings stops to the



Humphrey Rodex automatic gage, offered by General Gas Light Co.

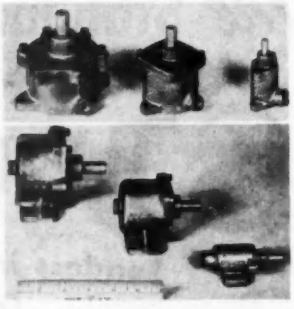
position required for the bend. Provision is made for dis-engaging the rack from the gears to permit use of the gage as a single-stop gage. Gage stops are strategically located in the rotating member to meet practically any bending requirement.

K-33—Air-Clamp Cylinders; Three-Way Valves

A. Schrader's Son, Brooklyn, N. Y., has designed and produced a complete line of powerful bantam sized air-clamping cylinders of compact spring-return push type, for industrial applications. Two styles permit easy installations in verticle or horizontal mounting positions. The cast brass body, which houses the piston assembly, is streamlined. All moving parts are easy to replace and service.

These bantam cylinders, with one and two in. stroke lengths and bore sizes of 1, 2¼, and 3 in., when used as air clamps, save time normally consumed in manually setting mechanical clamps.

In addition to the bantam size air cylinders, Schrader also announces a



Schrader air-clamping cylinders and 3-way valves

new bantam size three way valve. While the overall size of this tiny valve is only 2⅛ by 1⅝ by 1 3/16 in., it has an air capacity of 10 cu ft per min at 100 lbs airline pressure. Designed primarily for use with the bantam air cylinders, the new valve is adaptable to many other installations. Built on a sliding disk principle, the valve houses a precision-lapped stainless steel disk which slides on a bronze ring, providing positive air-tight sealing action. Depending on installation, the valves may be manually or mechanically operated.

K-34—Electronic Motor Drive

A fractional horsepower Mot-O-Trol electronic adjustable-speed drive offered by Westinghouse Electric Corp., Pittsburgh, Pa., starts, stops, and controls the speeds of ⅛- to ½-hp d-c motors, operated from single-phase, 50/60-cycle, 220/440-volt power sources.

The fractional horsepower Mot-O-Trol drive uses armature control to make possible a speed range of 20 to 1 at constant torque. Smooth, stepless speed control is assured on either speed increase or decrease. The drive provides dynamic braking, overload and low-voltage protection. Separate field rheostats and linestarters are not required.

Westinghouse fractional hp Mot-O-Trol Drive

A small, compact control station is supplied for separate mounting at a location convenient to the operator. This is used to control starting, stopping, direction of rotation (on reversing design) and speed of the motor.

Other components, used to rectify the a-c power for the d-c motor, are enclosed in a wall-mounted NEMA Type 1 enclosure.

K-35—Machinability Tester

Details of the M.S.E. Schlesinger Machinability Tester, a simple workshop unit for testing the machinability of ferrous and non-ferrous metals, have been released by the Vanton Equipment Corp., New York, N. Y.

The tester investigates two basic characteristics of metals. First, it measures the specific cutting Resistance exerted by a material against the penetration of a standardized kind and shape of cutting tool. Second, the unit measures the abrasiveness effect of the same work material on a hardened calibrator. The Schlesinger machinability index is defined as machining effort, determined by multiplying the measured specific cutting resistance by the measured abrasion factor. The complete M.S.E. Schlesinger machinability tester unit consists of the following equipment: cutting resistance dynamometer with direct reading indicator, including calibration beam and 11 standard weights; abrasiveness attachment with mm magnifier and ½ gross 10 mm test balls; set of eight standardized carbide tipped cutting tools; universal grinding fixture for maintaining all tool angles as specified; nose grinding fixture for maintaining the accurate nose radius of all tools.

(*Turn to page* 65, *please*)

Precise and regular as clockwork...

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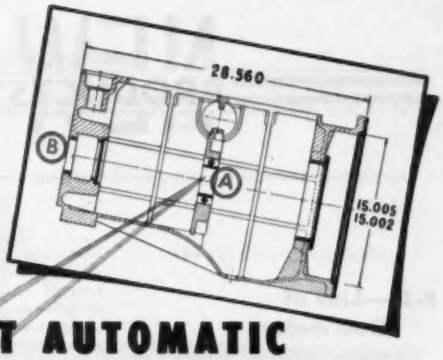
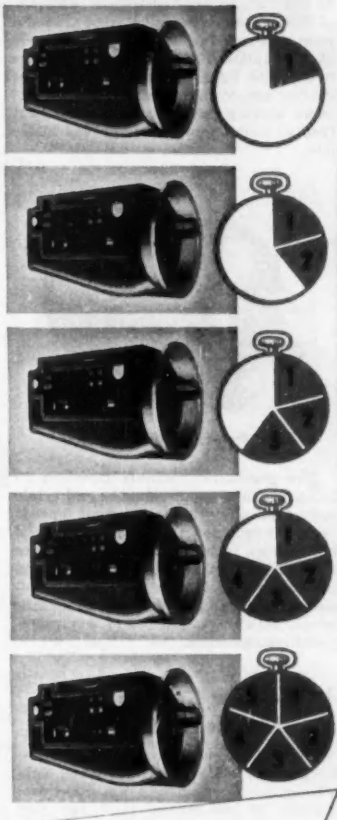
ON THE

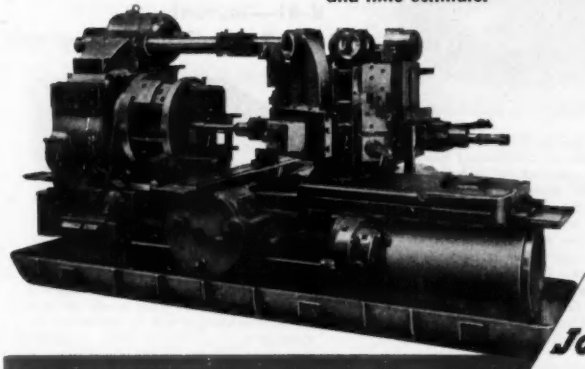
POTTER & JOHNSTON 8DXT AUTOMATIC



23 operations on this Crankcase are indicated by the heavy lines in the drawing — all precision-machined *in one holding* on the P&J 8DXT. The smaller size of the middle bore "A", in relation to the back bore "B", presented a problem. Skillful P&J Tooling solved it, and delivered excellent productivity by completing the job at the rate of one Crankcase *every 12 minutes* at 85% efficiency.



It's the combination of the P&J Automatic and P&J Tooling — in this case the special work-holding fixture plus the P&J-engineered cross slide and turret Tooling — that accounts for the elimination of all unnecessary work handling. Many cuts are combined, and machining time is lowered. As a result, operating costs are greatly reduced. You can attain the same economy-advantages in any multiple operation work on castings and forgings by getting a P&J Tooling recommendation. Simply send a sample part or prints for a tooling and time estimate.



8DXT AUTOMATIC
for work requiring up to 36" swing over bedways

Potter & Johnston Company
Pawtucket, R. I.
subsidiary of Pratt & Whitney
Division Niles-Bement-Pond Company

P&J

NEW PRODUCTS

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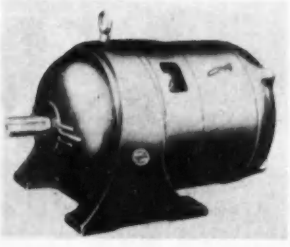
(*Continued from page 60*)

K-36—Line of Gearmotors

Foote Bros. Gear and Machine Corp. of Chicago, Ill., and the Louis Allis Co. of Milwaukee, Wis., have inaugurated a joint program for manufacture and sale of a complete line of gearmotors. The new Foote Bros.-Louis Allis gearmotor makes use of hard helical gears and other moving parts processed and heat treated under new and improved methods.



Foote Bros.-Louis Allis gearmotor

The gearmotor, manufactured in 17 sizes, provides single, double and triple reduction units having output speeds from 780 rpm down to 7.5 rpm. Integral hp ratings from 1 through 75 hp are available for practically any industrial application. Selection of motor enclosures includes open drip-proof, splash-proof, totally enclosed and explosion-proof construction.

K-37—Low Carbon Stainless Steels

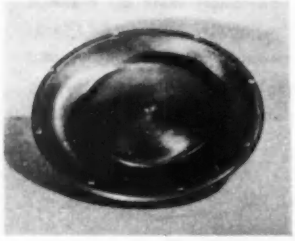
Carnegie-Illinois Steel Corp., Pittsburgh, Pa., a United States Steel Subsidiary, is prepared for commercial production of low-carbon (0.3 per cent max.) stainless steels made possible through a mastery of processing which minimizes intergranular corrosion.

Up to the present it has been necessary to add columbian or titanium austenitic stainless steels as "stabilizers" to minimize the adverse effects of carbon and to thereby render the alloy less susceptible to intergranular corrosion. The supply of these elements, sometimes critical, has pointed to avoiding their use unless absolutely necessary in the interests of conservation.

It has taken a decade by Carnegie-Illinois to prove that the commercial manufacturing techniques for production of chrome-nickel stainless steels with lowest possible level of carbon are economically sound. Concurrently it has taken that long to accumulate sufficient corrosion-testing data to justify consumer acceptance of 0.03 per cent maximum carbon stainless steels for use in the many applications in which columbian or titanium stabilized stainless steels formerly were used. Significantly, the testing program is said to have indicated that the 18-8 steels containing not more than 0.03 per cent carbon have a resistance to intergranular corrosion which is equivalent to that of the 18-8 columbian and titanium stainless steels.

Welding tests are stated to have confirmed these results and demonstrated that the low-carbon 18-8 materials can replace the stabilized types for applications such as welding, which involve short heating times in the sensitizing temperature range.

K-38—Outlet for Air Conditioning



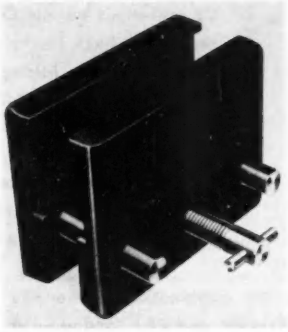
For buses, trailers, truck sleeping cabs, and other vehicle air conditioning applications, this outlet, manufactured by Barber-Colman, Rockford, Ill., eliminates drafts by reason of design of the deflector. Screw adjustment varies the supply of air volume. A lock-nut eliminates passenger tampering. Cast aluminum construction is light weight and rattle proof. The unit can be mounted through the countersunk screw holes in the outer ring. Outlets are supplied with a clear anodized finish which can be painted to match any surroundings.

K-39—Aluminum Disk Wheels

New forged aluminum disk wheels made by the Aluminum Co. of America, Pittsburgh, Pa., for truck, trailer, and bus manufacturers are commercially available in both the 7.50 in. by 20 in. and 7.50 in. by 22 in. sizes.

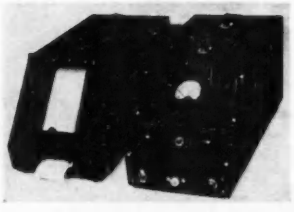
These new aluminum wheels effect a reduction in unsprung weight that reaches 50 lbs per wheel in the larger size. Every pound saved by using these aluminum wheels can be replaced by a direct increase in payload without exceeding maximum axle loading. The precision manufacturing process employed is said to assure wheels that will run true with easier steering and longer tire life. The one-piece forged wheel rapidly dissipates heat generated at the rim area, and this too helps reduce tire wear.

K-40—Chain Breaking Vise



Steel jaw chain breaking vise of the Morse Chain Co., Detroit, Mich. (Division of Borg-Warner) accommodates all American Standard sizes of roller chain from ½" pitch to 2½" pitch, single and multiple widths. Changes for accommodations of different sizes may be made instantly, but settings are accurately maintained until readjusted. Jaws are heat treated alloy steel.

K-41—Instant Recording Oscillograph



Instantaneous recording on a strip chart at frequencies up to 120 c.p.s. is achieved with the oscillograph put out by the Photron Instrument Co., Cleveland Ohio. Complete instrument includes amplifier and single or double channel recorder. However, amplifier or recorder may be used separately. Chart speed is variable from zero to maximum speed. A small plexiglass door is provided on the front of the instrument to give access to the chart for making notations. Front of case is hinged for ease in replacing chart paper rolls.

(*Turn to page 65, please*)

THE "LEADER" ON *Finishing* TAPS

Fig. 1
Acme thread, 1-9/16" dia., left-hand, ¼" pitch, 1½" lead, sextuple, length of nut 3½".

Fig. 2

Fig. 3

Fig. 4

NO... this is not a self-applied pat on our own backs. Here's the story... and the pictures.

FIG. 1... shows a difficult tapping operation successfully performed with a set of 3 H-W "Finished Taps"... (finished after hardening).

FIC'S. 2-3-4... show the two reasons for the successful job... one, the spiral flutes at right angle to the thread, which give correct cutting action to both sides of the teeth... two, the "Leader" sections on taps (Fig's. 3-4), which correctly engage the thread cut by the first tap (Fig. 2), and follow exactly the same accurate path. This thread had to be chased until Hanson Process taps were used. The economy of "Finished Taps" is therefore evident... as are the design and accuracy of H-W taps.

HANSON-WHITNEY MACHINE CO., HARTFORD 2, CONN.
Division of Whitney-Hanson Industries, Inc.

Valuable engineering, illustrated catalog on request. Please use your business stationery.

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H-26 Science in the Foundry

Campbell, Wyant and Cannon Foundry Co.—A new 20-page brochure explains and illustrates the foundry techniques which have been developed to combine science with craftsmanship. It contains information on metallurgical advancements and precision control methods; charts of physical properties and typical applications which simplify the selection of metals for castings, and gives specific information on cast camshafts, crankshafts, gears, pistons, cylinder blocks and heads, various types of steel castings and centrifugally cast cylinder liners and brake drums.

H-27 Broaches and Cutting Tools

The Continental Tool Works, Div. of Ex-Cell-O Corp.—A new 136-page illustrated tool catalog is available. It lists and describes all Continental standard cutting tools (carbide and high-speed steel), shows special tools and contains a complete broach and fixture section with drawings and photographs. Useful information and charts used by the metalworking industries are included for ready reference.

H-28 Aluminum Products

Revere Copper & Brass Incorporated —A new booklet, "Revere Aluminum Products," contains complete descriptive information about the various forms in which Revere aluminum is fabricated. Included are a large number of illustrations of products using Revere aluminum alloys in the form of extruded shapes, tube and coiled sheet. A chart with comprehensive tables is also included. It gives the properties and characteristics of most of the wrought aluminum alloys.

H-29 Vinyl Plastic Film

R. M. Hollingshead Corp.—A new folder is available which describes Cocoon, a vinyl plastic strippable film, used in packaging, shipping and storage, for equipment of any shape or size. The folder explains the method of applying Cocoon, its properties, uses, etc.

H-30 Maxitorq Clutch

Carlyle Johnson Machine Co.—The 1950 edition of the Maxitorq flating disk clutch catalog contains engineering drawings, cut-away illustrations and complete specifications covering eight standard sizes, in single and double types, wet or dry. A new section shows three types of Driving Cups . . . Pulley type, Cut-off Coupling type and Ring type. Automatic Overload Release type cups are also shown with diagrams, description and specifications. Typical installations, suggestions for correct clutch operation and maintenance and complete specification form for ordering are also included.

H-31 Ferrous Metallurgy Chart

Tempil® Corporation—A 4th printing of the company's "Basic Guide to Ferrous Metallurgy" shows the working characteristics of steels in temperatures from minus 300°F to 2900°F. All the important temperature zones, including Hot-Working, Annealing, Normalizing, Stress Relieving, Carburizing and Preheating for welding are clearly defined.

H-32 Profilometers

Physicists Research Co. — An illustrated bulletin entitled "Practical Operating Features of the Profilometer" describes the advantages of the Profilometer for shop measurement of surface roughness. The booklet covers the instrument's suitability for use in production departments, simplicity and speed of operation, dependability of roughness readings, etc. Illustrations show the range of work measured.

(Turn to page 72, please)

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THIS TIME SAVER COUPON is for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on other pages.

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NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 64

(*Continued from page 62*)

K-42—Portable Power Supply

A 6-volt portable DC power supply announced by P. R. Mallory & Co., Inc., Indianapolis, Ind., is designed as a convenient source of DC current wherever 110-115 volt AC current is available.

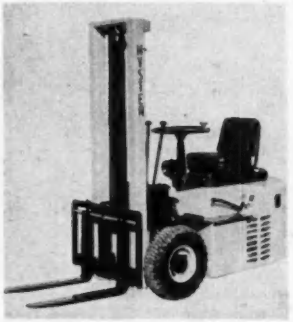
The new unit, Mallory 6RS10, is for testing and demonstrating automobile radios and electrical equipment, small electroplating equipment, operation of laboratory equipment, DC magnets, solenoids, relays, motors, clutches, brakes, chucks, etc.

DC voltage is continuously variable from 0 to 8 volts. The unit may be safely operated continuously at 10 amps and intermittently at 20 amps. It has a filtered DC output with less than 1.0 volts ripple at 6 volt, 10 ampere output.

The power supply is fully equipped with a 0-20 amp. DC ammeter, a 0-10 volt DC voltmeter, a self-resetting circuit breaker in the DC line, a switch and fuse in the AC line, and a six-foot AC cord. Overall dimensions are 6¾ in. high, 10⅝ in. wide and 5½ in. deep. Shipping weight is approximately 13 lbs.

K-43—Improved Lift Truck

On the market for the first time in February is an entirely new 2,000 lb capacity lift truck, Model 20 produced



Hyster 2000 lb capacity lift truck, Model 20

by the Hyster Co. of Portland, Ore., and Peoria and Danville, Ill. Smallest in the company's line of seven industrial trucks, the new machine incorporates more than 70 basic improvements in design and construction.

Powered by a new Wisconsin air-cooled engine which can withstand great extremes in weather conditions, the new truck operates at substantially lower running temperatures because of alterations in both design and installation of the engine. Among engine changes are a new intake manifold; re-design of shrouds to pull cool, clean air from the sides of the machine rather than from top or bottom; a new electric fuel pump; and a new distributor.

Engine accessory improvements include a larger automotive-type battery, a re-designed muffler with spark arresting features; and a larger gasoline tank with more than sufficient capacity to

Sure sign of value...

Exclusive features protected by U.S. patent Nos. 1958725, 2140818 and 2230471

IN ITS 16th YEAR OF FAITHFUL SERVICE TO MOTORDOM

Aetna T-type clutch release bearings have been the choice of value-wise car, truck, bus and tractor manufacturers since 1934. And there are good reasons why: Once installed they are trouble-free, attention-free for vehicle life. Thanks to their patented design and self-lubricating features there's no need of costly machining operations for oil lines or grease fittings—no need of further maintenance whatsoever. Think what that means in increased assembling efficiency and lower assembly costs, in cementing the vehicle owner's good will.

It's a trusty sign of dependability and economical performance in any vehicle—the famous Aetna T-type bearing. Investigate. Find out the many other sound reasons why Aetnas deserve a place in your specifications.

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Aetna

T-TYPE Clutch Release BEARINGS

WITH THE... ...THAT TAMES TROUBLE

NEW PRODUCTS

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permit full eight-hour work shifts without refilling. The transmission is now heavier; the clutch larger. The new 20 may be fitted with the usual Hyster special-purpose attachments such as Load-Grab, Paper-roll grab, scoops, booms, guards, towing hooks, etc.

K-44—Demagnetizer for Precision Parts

A compact unit for demagnetizing precision parts which have had magnetism induced in them either through use of magnetic chucks or grinding or other high speed machining operations, is being marketed by Dings Magnetic Separator Co., Milwaukee, Wis. Engineered for maximum demagnetizing force, this demagnetizer provides a convenient method of overcoming the dangers of chips or magnetic dirt adhering to parts, causing scoring or failure of close tolerance machinery.

The unit is installed at a 45 deg angle, the parts to be demagnetized being placed in the aperture and allowed to fall through. For continuous duty it is installed horizontally with a rubber conveyor belt moving through the coil. There are no moving parts in the unit itself. Wires are glass insulated. The unit is available in 3 in., 5 in. and 6 in. sizes, 220 or 440 volts A. C.

K-45—Windshield Speedometer

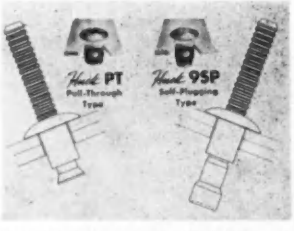
Exact speed of a moving automobile is projected to a dime-sized screen located on the windshield by installation of the Glowmeter, a new automobile speedometer accessory, produced by Silver Creek Precision Corp., Silver Creek, N. J.

This new device constantly projects the changing reading from the dashboard speedometer to a tiny metal screen fastened on the windshield approximately two in. below the driver's normal line of sight. The Glowmeter screen changes color and the driver is conscious of changing speed as the three colors alternate with each 10 mph change in speed. The driver need not look at the numerals on the Glowmeter screen to know of his speed variations.

Glowmeter can be assembled into standard automobile speedometers upon adoption as standard equipment by automobile manufacturers, this company states. Two car builders in different price fields are said to now have the right to adopt it as standard equipment.

K-46—Blind Rivets

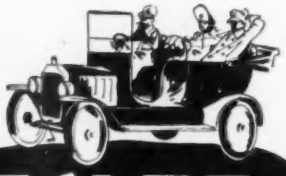
Two new blind rivets for fast easy driving, announced by Huck Mfg. Co., Detroit, Mich., are the Huck PT Pull-Through type and Huck 9SP Self-Plugging type, available in ⅛ in., 5/32 in., 3/16 in. and ¼ in. diam. Both are furnished in aluminum alloys or cadmium-plated mild steel, with brazier or 100 deg countersunk heads.



Huck blind rivets. Left—PT Pull-Through type. Right—9SP Self-Plugging Type

Huck Pull-Through type blind rivets

Since the Beginning of Mass Production



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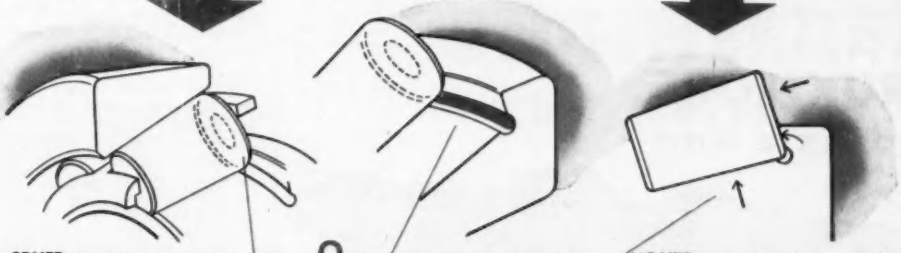
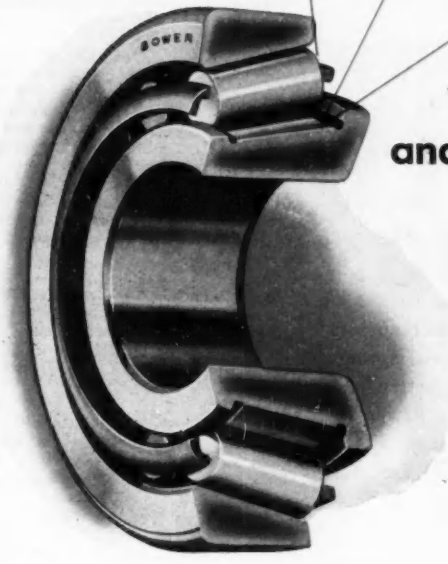
SPHER-O-HONED



SPHER—Stands for generated spherical roll-head and flange surfaces designed and manufactured to the exact contour they would otherwise acquire in use. Alignment is improved; wear minimized.

O—Stands for the liberal oil groove which assures a generous supply of lubricant at the critical point where the roll-head operates against the flange, greatly reducing destructive friction.

HONED—Stands for hard, durable races which are honed to micro-inch smoothness. This bonus of precision eliminates the problem of run-out and also prolongs the life of the bearing.



. . . to improve your product and your plant equipment, too!

Look closely at Bower Spher-O-Honed bearings. Note these basic refinements in design and construction—generated spherical roll-head and flange surfaces; large oil grooves; precise, durable races.

You'll see they can benefit your manufacturing operation in two *distinct ways:*

Installed in your product, Bower bearings contribute positive dependability—wear resistance—long life. They can help make yours a better product, better able to meet competition.

Installed in your plant equipment, Bower bearings guard the precision of your machines—boost efficiency—reduce maintenance problems. They improve your ability to produce a quality product.

Whatever you manufacture, from limousines to bulldozers—and whatever plant equipment you use, from machine tools to lift trucks—it will pay you to standardize on Bower bearings.

BOWER ROLLER BEARING COMPANY, DETROIT 14, MICH.

BOWER

ROLLER BEARINGS

NEW PRODUCTS

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are said to have no minimum grip limitation, while Huck 9SP Self-Plugging type blind rivets have a grip range of 0.140 in. for any grip increment, a feature simplifying both driving and inventory. In addition, positive shank expansion provides ample hole-filling to meet all normal requirements. Engineered features prevent splitting of the sleeve during formation of the blind head.

The pin tail of the rivet is provided with pull grooves to assure positive driving. The rivets are inserted in the gun or hole with equal ease. Once inserted in the gun, they cannot wobble, fall out, or move to cause improperly-driven rivets—particularly helpful in riveting hard-to-reach or overhead holes. The pulling section will not break off prematurely in driving. The pin tail is automatically ejected by the next rivet and cannot become jammed in the driving gun.

These rivets are driven by a single operator with a manual or pneumatic pull gun, and require access to only one side of the work. The gun requires no adjustment for grip length. Adaptors permit using other pneumatic pull guns.

Men in the News

(*Continued from page* 25)

Air Reduction Sales Co.—The appointment of **Charles H. Glasier, Jr.,** as Manager of distribution for the company, has been announced. **J. H. Fox** has been named Asst. Manager of Distribution.

Sealed Power Corp.—**Raymond R. Beardsley** has announced his resignation as Secretary of the company. He will continue as Vice-President and a Director of the company. The promotion of **Ed Gray** to Asst. Sales Manager and **Cy D. Ward** to Western Regional Manager has been announced.

Hannifin Corp.—**Leo S. Ohman** has been elected to the newly created position of Vice-President in Charge of Manufacturing.

Reynolds Metals Co.—**William B. Moore, Jr.,** has joined the company as a technical service engineer.

The Falk Corp.—The appointment of **Arthur L. Larson** as Asst. to the Sales Manager has been announced. **William J. Urban** has been appointed Manager of Coupling Sales. **Roland E. Govan** heads Sales Promotion, a newly organized department at Falk.

American Steel & Wire Co.—The election of **Walter F. Munford** as Vice-President in charge of operations has been announced.

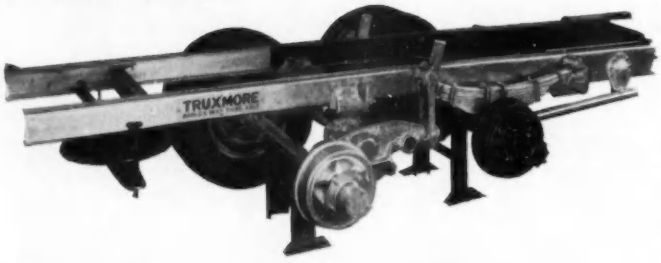
The Weatherhead Co.—New executive appointments have been announced as follows: **John D. Smetzer** has been appointed Vice-President in charge of Industrial Relations. **John D. Baldwin, Jr.,** has been made Chief Engineer.

Lycoming-Spencer Div., Avco Mfg. Corp.—The appointment of **R. J. Cowden** as Sales Manager for engines and related products, has been announced.

The American Welding & Mfg. Co.—Changes in the Sales Dept. have been announced as follows: **M. R. Minnick** has been appointed General Manager of Sales and in addition will have personal supervision of the company's railway equipment division. **H. D. Malone** has been made Manager of Sales of a newly created Industrial Products Div. **D. W. Dawson** has been named manager of the Product Development Div.

The Budd Company—**Charles J. Davitt** has been appointed Director of Traffic.

TRUXMORE
3rd Axle Unit



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Alloy Steel **SPRINGS**

Truck Equipment Company's axle unit doubles payload capacity with Tuthill designed springs —provides tandem axle advantages, better load distribution and longer tire wear. Fewer inspections and lubrications are necessary. Keeps trucks rolling longer . . . mechanics free for other duties.

Special leaf springs designed to meet any requirement.

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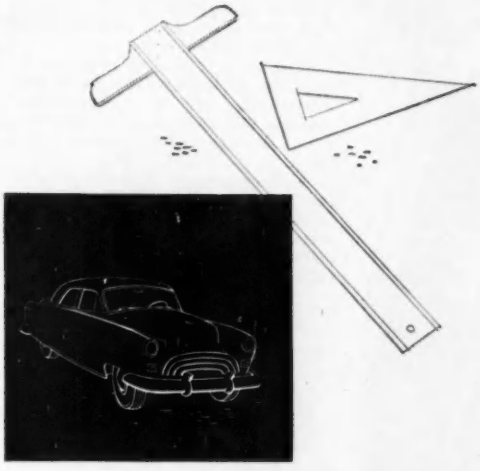

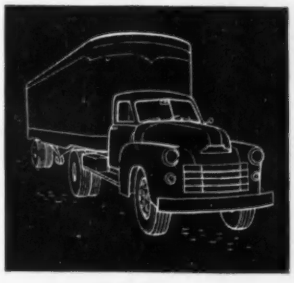

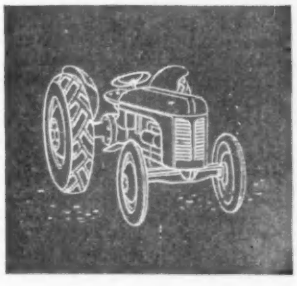

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Complete engineering of the cooling system as a whole is the Harrison method of attaining correct performance. It is effective in reducing costs, too—for it enables us to minimize the size and weight of the radiator, with corresponding savings in the costs of core, mountings, and parts.

When a manufacturer of cars or buses, trucks or tractors, puts his cooling problem up to us, we engineer the entire cooling system, taking into consideration fan location, shrouding of the radiator core, method of core mounting, and every other factor that affects performance. In the end, all the variables are in correct balance, coordinated for teamwork.

Harrison engineers invite manufacturers to avail themselves of our complete testing laboratories, extensive field experience, and unmatched production facilities. Harrison Radiator Division, General Motors Corporation, Lockport, New York.

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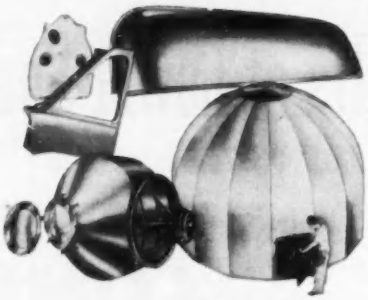
- Precision Workmanship
- On-the-Dot Deliveries
- Wide Range



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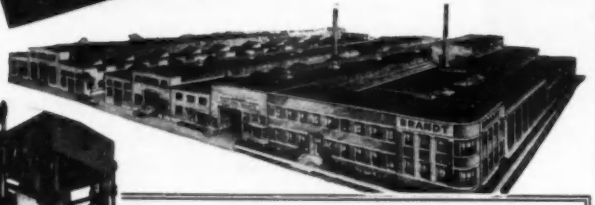

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Control Shock for High Compression

(*Continued from page* 47)

energy of the deflecting engine parts is finally dissipated in the form of work done in producing dynamic deflection of the parts.

Fortunately, the shock effect can be controlled in the chamber design by predetermination of the pressure-time characteristic of combustion. This control is accomplished by proper distribution of the chamber volume relative to the ignition point. This geometry in turn determines the variation in flame front area, and consequent change in mass rate of burning during the progress of combustion. The complete theory and application of this method was presented in a paper which was published in the SAE Transactions twenty years ago. Both Alex Taub and I have independently applied this method of shock control by chamber geometry and proved that it works time and again.

The higher the compression the more vital such control becomes because excessive deflection of the load carrying parts is destructive and can seriously shorten engine life. The sense of roughness produced by combustion shock is merely a sympton of its destructive action. This is where economics again come into the picture.

Even if detonation were eliminated overnight by some chemist's wand, the combustion shock problem would remain to plague us. Unfortunately, perhaps, there is no foreseeable chemical solution to this problem. We are going to have to lick shock the hard way, if we are to achieve practical engines of 10 or 12 to one compression ratio.

One more word on shock. Beefing up the engine alone is not the answer. For it is inherent in the dynamics of the problem, that reduction in shock deflection will be produced only to the extent that rigidity increases relative to mass. Increased rigidity is essential for high compression in any case but unless shock is minimized at the store, uneconomic or impractical engines will be the probable result.

Needless to say, it is extremely unlikely that today's conventional engines will ever be able to operate at 10 or 12 to one compression ratio without fuel of practically unlimited octane rating.

If we are to reach this goal with reasonable fuel, new departures in engine design will be necessary. Alex Taub has given us a carefully screened assortment of ideas which should stimulate a lot of constructive thinking along unconventional lines. Intensive exploration of this kind, properly directed, is bound to lead to large gains in engine efficiency which are also economically sound.

FOR

Whatever You Make That's *Electrical*

CHECK THE ADVANTAGES OF AN ESSEX *"NERVE SYSTEM"*

Wire for a mechanical man?—Easy! Just another successful solution of a complex wire assembly need that's daily routine with trained and proved ESSEX EXPERTS.

Drop a coin in a slot—out comes anything from a sandwich to a can of fishing worms. Is it any wonder people say these machines are almost human? There's a reason! ESSEX WIRE ASSEMBLIES operate such products dependably and accurately.

Thanks to experienced specialists and a network of twenty factories, ESSEX engineers, processes and controls assemblies from wire bar to your appliance. This includes connectors, terminals, coils, relays.

With an ESSEX WIRE ASSEMBLY you can stop your electrical worries and actually enjoy greater economy, proved dependability and precise uniformity. Essex engineers diagnose your problems and custom-build assemblies for your products. Essex will prove its points by furnishing you with a sample assembly built to your specifications. Get the facts today.

Consult an Essex representative, or send your specifications to the Service Engineering Department, Wire Assembly and Cord Set Division.

BUILT TO PERFECTION WIRE ASSEMBLY AND CORD SET DIVISION *PROVED BY INDUSTRY*

ESSEX WIRE CORPORATION MONTICELLO, INDIANA

Publications Available

(*Continued from page 64*)

H-33 Hydraulics

Hannifin Corp.—Hy-Power Hydraulics, Bulletin No. 150, an attractive, illustrated booklet in color, describes operating characteristics, applications, standard equipment and gives ordering information on the company's riveters, presses, punches, generators, etc.

H-34 Inclinable Presses

The Federal Machine & Welder Co.—A new illustrated bulletin presents a line of high speed precision production inclinable presses with special emphasis on the needs of the press user. Specifications, sectional drawings with identifying parts lists, and other useful data are contained in the bulletin.

H-35 Oil Hydraulic Pumps and Controls

Vickers Incorporated — Industrial Products Catalog No. 4900 which describes and illustrates the various types of Vickers hydraulic pumps and controls is available. The booklet is in color and shows typical performance curves, operating characteristics, features of the various types of pumps, specification and performance data, installation details, etc.

H-36 Hydraulic (Oil) Cylinders

Vickers Incorporated—Bulletin 49-55 covers a new and extensive line of hydraulic (oil) cylinders for industrial service. Information is included on the features of the new cylinders, drawings and specifications and engineering data.

H-37 Ball Bearings

Nice Ball Bearing Co.—Catalog No. 140 describes and illustrates the complete line of ball bearings and introduces a new composition sealed bearing design. The line covers radial, thrust and combined radial-thrust bearings ranging from close tolerance precision units to pressed steel bearings of the unground type. Other Nice anti-friction products such as ball bearing sleeves, rollers, wheels and casters are covered.

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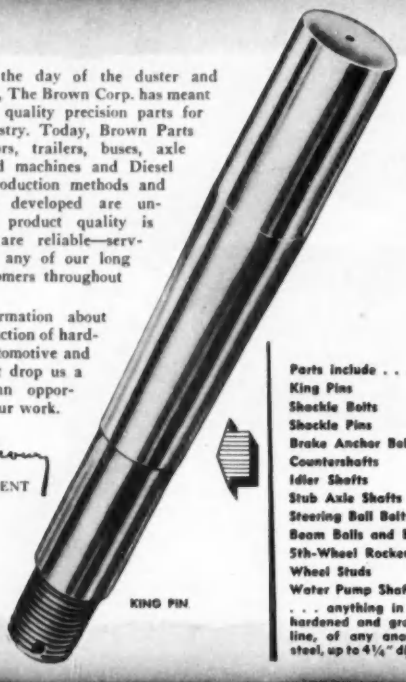
SINCE the day of the duster and goggles, The Brown Corp. has meant highest quality precision parts for the automotive industry. Today, Brown Parts serve trucks, tractors, trailers, buses, axle builders, off-the-road machines and Diesel locomotives. The production methods and facilities we have developed are unexcelled — uniform product quality is assured—deliveries are reliable—service is efficient. Ask any of our long list of satisfied customers throughout the industry.

For further information about our specialized production of hardened and ground automotive and industrial parts, just drop us a note. We invite an opportunity to quote on your work.

Henry W. Brown

PRESIDENT



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. . . anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

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BOOKS ...

SPECIFICATIONS AND TESTS FOR ELECTRODEPOSITED METALLIC COATINGS sponsored by A.S.T.M. and A.E.S. The 1943 edition of this publication, sponsored jointly by American Society for Testing Materials and American Electroplaters' Society, brings together in convenient form all of the standard specifications and test methods pertaining to electrodeposited metallic coatings on metals.

In the compilation are specifications for various types of electrodeposited coatings on steel, i.e.: zinc, cadmium, nickel and chromium, and lead. There are specifications for electrodeposited coatings of nickel and chromium on copper and copper-base alloys, and on zinc and zinc-base alloys; also a specification which covers chromate finishes on electrodeposited zinc, hot-dipped galvanized, and zinc-cast surfaces. Two methods are given, one covering test for local thickness of electrodeposited coatings, and the other salt spray (fog) testing.

Included also are the recommended practices for chromium plating on steel for engineering use, and the preparation of low-carbon and high-carbon steel for electroplating.

Copies of this 62-page publication, paper cover, can be obtained from American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., at $1.25 each.

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carefully. There is meat
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Fatigue Resisting

SPRING STEELS

Excellent resistance to fatigue, good impact value, and ready response to heat-treatment are three advantages you get with all Bethlehem spring steels. But the extent to which these all-important properties are present depends largely on the grade of steel you use in relation to the size of the finished spring section and the stresses to be encountered in service.

Whatever type of springs you make we will gladly help you select economical grades of steel and advise you concerning applications and treatment. Our metallurgists will make every effort to help improve your product as well as to reduce your costs. Bethlehem manufactures all the AISI grades, as well as special steels.

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★ BETHLEHEM STEEL ★

New Dodge Truck Has Twin Carburetors

(*Continued from page 35*)

A heavy-duty 13-in. clutch is standard equipment. Lining area is 177.8 sq in., linings being of metal-impregnated woven type. Permanently adjusted eye-bolts are said to compensate for lining wear. T ball-type pilot bearing and permanently lubricated ball-type release bearings provide trouble-free performance.

A five-speed, constant-mesh helical gear transmission, having a torque input capacity of 330 lb ft, is standard on Y-models. Available as optional equipment is a five-speed, helical gear, constant-mesh overdrive transmission. An individual, single power take-off gear is available from either the right or left hand side of the case, so designed as to relieve the load on driving gears. A magnetic drain plug affords extra protection in service.

Better weight distribution and highly desirable maneuverability have been achieved by balanced positioning of the engine and front axle. The engine is farther forward in the frame and the front axle is farther back on the frame than has been common practice. This design, used on all Dodge trucks, also increases useful body length for a given wheelbase.

Front and rear springs are of Amola steel, the front being 48 by three in. while the rear 52 by three in. Front springs are shackled at the rear. Auxiliary rear springs are standard equipment.

Four-wheel hydraulic brakes, with a 9½-in. dual diaphragm, sealed, vacuum brake booster unit, are standard equipment. It is of interest that the brake booster is fitted with steel tubes and positive seal-type fittings to keep dirt out of the booster and engine. Front wheel brake cylinders are of stepped diameter type; while rear brakes are of dual-primary type. Brake linings are Cyclebonded, with service braking area of 486.25 sq in. The independent parking brake system has a lining area of 128.5 sq in.

A full air brake system with lining area of 531 sq in. is available at extra cost.

Rear axle equipment for the Y Model includes a standard 18,000 lb capacity, single-speed hypoid axle with a ratio of 6.83:1. An optional single-speed, double-reduction unit having a capacity of 18,000 lb and a ratio of 8.53:1 is also available. In addition, Dodge offers the YA dual-purpose models with an 18,000 ft capacity two-speed axle as standard equipment. This axle has a 6.53/8.53:1 ratio.

For extreme service, Dodge offers a line of 22,000 lb capacity rear axles. Available for the Y Models is a single-speed axle having a 7.4:1 ratio, and a single-speed, double-reduction axle having a 9.23:1 ratio. The dual purpose YA Models are also available with a 22,000 lb capacity, two-speed rear axle with optional ratios of 6.41/8.37:1 and 7.27/9.49:1. Shift control for the two-speed axles is located on the gear shift lever.

The drive line incorporates universal joints having four needle bearings for each joint; and large diameter, light weight tubular propeller shafts having greater strength and rigidity to resist whip at high speeds.

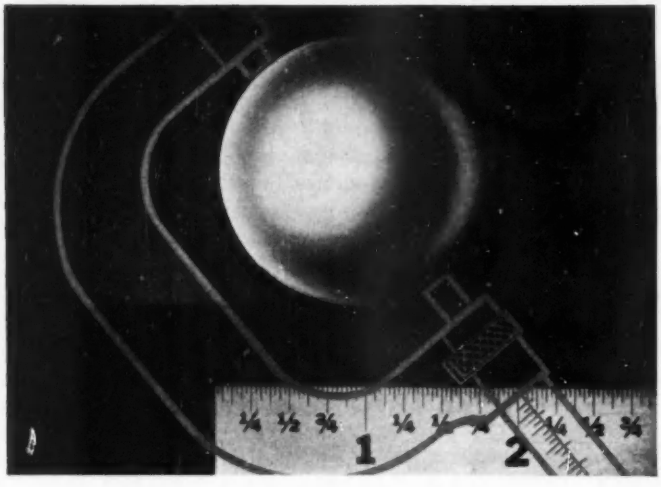
Steering gear is of cam-and-twin lever type, with variable ratio—19.5 to 1 in straight ahead, and 23.4 to 1 in full turn position. The steering wheel is 20-in. in diameter.

Standard wheel equipment consists of 20-in. diameter wheels with cast spokes fitted with wide base demountable rims. Disk wheels are available

(*Turn to page 76, please*)

ONLY A BALL

has...One Dimension...One Surface



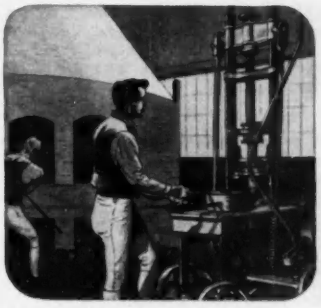
but oh—how important

Important not only in precision ball bearings, but also in the lot of other applications where Strom metal balls have been doing the job better. Strom has been in on a great many ball-application problems, and knows how important these two factors are for the best results.

Strom has been making precision metal balls for over 25 years for all industry and can be a big help to you in selecting the right ball for any of your requirements. In size and spherical accuracy, perfection of surface, uniformity, and dependable physical quality, there's not a better ball made.

Strom STEEL BALL CO.
1850 So. 54th Ave., Cicero 50, Illinois
Largest Independent and Exclusive Metal Ball Manufacturer

1 **1621**—Glass was money! America's first glass factory was actually a mint—not for the manufacture of coins but to make glass beads for *use* as money when buying land, food and furs from the Indians.



2 **1827**—Blown glass was the rule until Enoch Robinson, a carpenter, figured glass could be *pressed* into shape . . . the glass pressing machine was born. Electricity to power new machines was still to come.

3 **1899**—Owens invented a machine to make bottles as the machine age arrived in glass. By 1915, Howell "Red Band" Motors were making important contributions to this and other industries.

ANOTHER HOWELL SUCCESS STORY

GLASS...from artisans to automatic machines

4 **Today**—Modern, electrically driven machines have improved quality, cut costs and increased output in the glass making industry. For example, this unique glass beveling machine, equipped with 7 dynamically balanced Howell Motors, *automatically* bevels glass at the rate of 2,000 inches per hour!

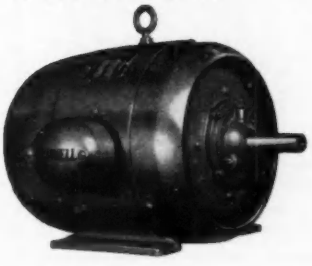
You'll also find precision-built Howell Industrial Type Motors powering bottle and bulb machines, conveyors, grinders, polishers, plate and window machines in the glass industry.

Elsewhere, Howell's wide range of standard NEMA motors, and special motors designed to customer requirements, serve dependably and efficiently under the toughest conditions.

For a really profitable investment, buy HOWELL!

Free enterprise encourages mass production, supplies more jobs—provides more goods for more people at less cost.

Howell totally enclosed, fan-cooled motor—windings completely sealed against dirt and weather.



HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Precision-built Industrial Motors Since 1915

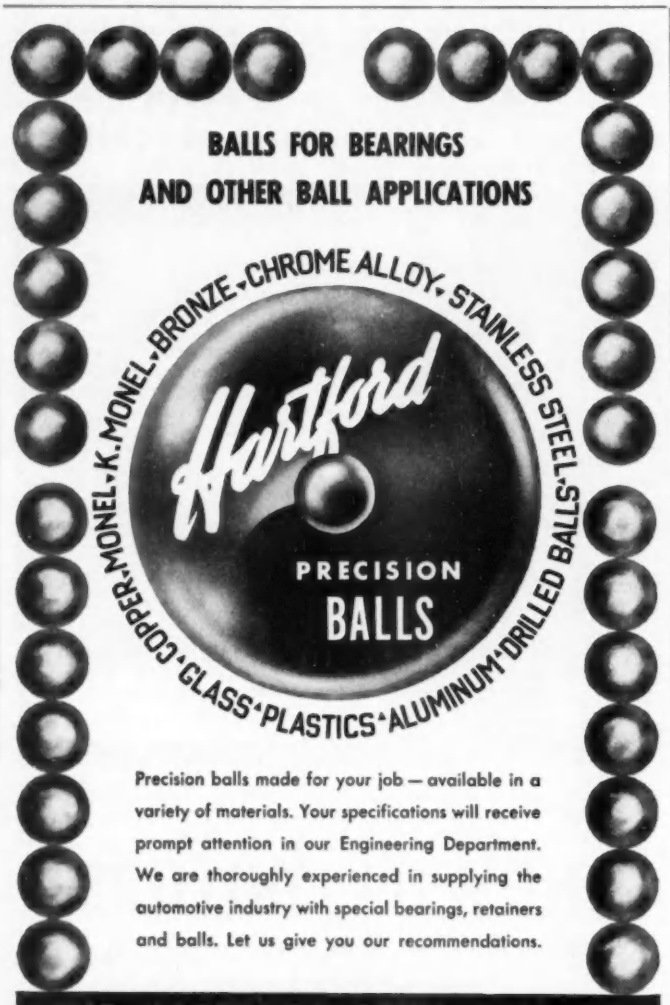
HOWELL Red Band MOTORS

as extra equipment. Maximum tire sizes available for various GVW ratings are as follows: 11.00/20-12-ply—for 23,500 and 26,000 lb GVW; 11.00/20-14-ply—for 28,000 lb GVW.

Driver safety and comfort are assured by the proviison of the Dodge "Pilot-House" cab. Air-O-Ride seats are adjustable to the weight of the driver as well as to road conditions, variations in cushioning being effected by means of a conveniently located air valve. The entire seat assembly can be moved forward and backward over a range of four in. In addition, the seat cushion can be adjusted for three in. within the seat frame, thus giving a total adjustment of seven in. The front seat is said to have plenty of room for three full grown men, with abundant head room.

Conn and Welty Promoted in Ford Realignment

The Ford Motor Co. has announced the appointment of A. E. Conn as general purchasing agent and M. W. Welty as industrial relations manager for the Ford Div. The appointments are in line with Ford's decentralization plans for end-product divisions.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55 W. 42ND ST., NEW YORK

Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES.

General business activity increased moderately during the week ended Jan. 7. Department store sales, electric power production, and railway freight loadings were higher than in the preceding week, while crude oil output, bituminous coal production, and construction declined. The *New York Times* index of activity for the week ended Jan. 7 stands at 150.0, as compared with 144.7 in the preceding week and 149.5 a year ago.

Sales of department stores during the week ended Jan. 7, as reported by the Federal Reserve Board, equaled 205 per cent of the 1935-39 average, as compared with 204 in the week before. Sales were 25 per cent below the corresponding distribution in 1949, as against a preceding decline of three per cent.

Electric power production increased contraseasonally during the week ended Jan. 7. The output was 0.8 per cent below the corresponding amount in 1949, as compared with a decline of 1.3 per cent shown for the preceding week.

Railway freight loadings during the same period totaled 506,947 cars, 2.3 per cent more than the figure for the week before but 29.7 per cent below the corresponding number recorded in 1949.

Crude oil production in the week ended Jan. 7 averaged 4,926,700 barrels daily, 68,800 less than in the preceding week and 580,950 under the comparable output a year ago.

Production of bituminous coal and lignite during the same week is estimated at 5,630,000 net tons, 755,000 less than the output in the week before and 5,955,000 below the corresponding quantity in 1949.

Civil engineering construction volume reported for the week ended Jan. 12, according to *Engineering News-Record*, was $193,494,000, or 40 per cent less than the preceding weekly figure but 46 per cent above the comparable sum in 1949. The total recorded for two weeks of this year was 101 per cent more than the corresponding amount in 1949. Private construction for the period was 54 per cent above that a year ago, and public construction increased by 134 per cent.

The wholesale price index of the Bureau of Labor Statistics during the week ended Jan. 10, at 151.2 per cent of the 1926 average, was 0.5 per cent more than in the preceding week but was 6.3 per cent below the corresponding figure in 1949. Small advances were registered in all major commodity groups, with the exception of textile products and metals and metal products, which showed no variation.

Member bank reserve balances decreased $369 million during the week ended Jan. 11. Underlying changes thus reflected include a decline of $827 million in Reserve bank credit and an increase of $78 million in nonmember deposits and other Federal Reserve accounts, accompanied by decreases of $240 million in money in circulation and $292 million in Treasury deposits with Federal Reserve banks.

Total loans and investments of reporting member banks declined $199 million during the week ended Jan. 4. A decrease of $53 million in commercial, industrial, and agricultural loans was recorded. The sum of these business loans, $13,851 million, shows a net decrease of $1523 million in 12 months.

EVER SEE A

Spring Plant?

Drop around sometime at any of the plants in the group below for a sample of the methods that have produced some of the finest spring crops in existence. Early cultivation awaits your word.

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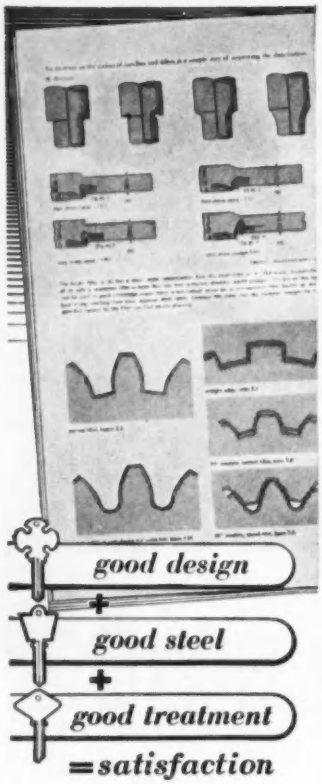

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A1-2 F20

Sintered Metallic Friction Materials

(*Continued from page* 37)

to warrant it.

The secret of molding lies in the uniform distribution of the powder in the mold prior to pressing. Metal powder flows sufficiently to act like a fluid, causing very high sidewall pressure on the molds, necessitating heavy, hardened steel molds to resist the pressure, but when the metal powders are improperly distributed, there is little evidence of this flow since weak and nonparallel wafers are produced.

The wafer, or "cookie," which comes from the mold is fragile. However, during the sintering or heat-treatment, the tin will be at least partially absorbed by the copper, and the bronze compact which results will have a tensile strength on the order of 5000 psi. This material is usually considered too weak to be used without reinforcement, and the great bulk of sintered metallic friction material is sold sintered onto a copper-plated steel core or backing.

To accomplish this sintering operation, the work is arranged in a vertical stack on the furnace base. The industry has apparently standardized on the use of the bell-type furnace with an inner retort. In making the stack, a graphited steel spacer is laid on the bottom, then a "cookie," followed by the copper-plated steel backing plate. With another graphited spacer, the cycle is started again. The work is piled in this manner to the desired height and carefully aligned vertically by means of fixtures for this purpose. In the case of a steel disk which is to be faced with friction material on both sides, it is arranged that a wafer is in contact with each side of the copper-plated steel in building up the stack.

The alloy inner retort is then placed over the charge and the "bell" or furnace is lowered onto the base. Pressure is applied on the stack during heating through the roof of the furnace by an air-jack or other suitable means.

Furnace loading and operation is a variable and somewhat complex operation. It may be generally stated that the heating necessary is ½ hour after the furnace load reaches the sintering temperature, which ranges from 1300 F to 1550 F, but most commonly is on the order of 1350 F. However, the heating cycle also depends upon the size and nature of the charge, and may vary from four to 20 hours. Generally, articles which have precise dimensions, with little stock allowed for further finishing, require long cooling periods, while more massive articles may be cooled more rapidly.

The furnace atmosphere is controlled by addition of charcoal or coke to the inner retort or a cracked gas atmosphere is used. After removal from the furnace, the friction articles are machined to blueprint dimensions and are ready for shipment.

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HOSE CLAMPS

The Standard of the Automotive Industry

Type A—Radiator Hose Connections

Type G-BB—Booster Brake Hose Connections No. G-B-HH for Hot Water Heater Hose

Type HP—High Pressure Hose Connections

Wittek Noc-Out Hose Clamps are designed in a variety of types made in many sizes for use by the automotive industry. Because they provide the most practical leakproof hose connection, they are specified by the leading manufacturers as standard, original equipment for automobiles, buses, trucks and tractors.

Write for descriptive literature.

Automotive HOSE CLAMPS

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4319 W. 24th Place, Chicago 23, Ill.

Dependability in Hose Clamps for Over a Quarter of a Century

. . . no rusting

. . . greater strength

. . . an extra ton of payload every trip

Secretary-treasurer Winton Teagle shows Driver Ed Wilkie one of the most vulnerable spots on a trailer that hauls moist produce. Corrosion-resistant Stainless Steel doesn't rust out here.

Rolling over the highway with a load of perishable produce, this Stainless Steel trailer is part of the fleet of Refrigerated Transport Company, Inc., Atlanta, Ga.

Three good reasons why this fleet operator says:

"We're sold on Stainless Steel"

REFRIGERATED TRANSPORT COMPANY, Inc., Atlanta, Ga., hauling perishable produce throughout the Southeast and into Midwestern states, began using Stainless Steel trailers only two years ago. But it didn't take long for the firm to realize the many benefits of this construction.

Let Winton Teagle, secretary-treasurer of the company, tell you the story:

"We've found that Stainless trailers won't rust out around the floor—very important when every load is made up of moist produce. And this same freedom from rust and corrosion makes our stainless trailers easier to keep clean. All our trailers are washed inside and out after each trip.

"A couple of turnovers quickly proved how much stronger Stainless construction is. Accidents that would have resulted in almost complete loss with other types of material hardly damaged our Stainless Steel trailers.

"And don't forget that these Stainless Steel trailers weigh about 2,000 pounds less than the ordinary type. That means an extra ton of pay load every trip."

And here's the clincher! We've just heard that Refrigerated Transport recently placed an order for five more Stainless trailers, doubling the size of its Stainless fleet.

No matter what you haul, you'll find that, from the standpoint of durability, maintenance, payloads and appearance, Stainless Steel construction really pays off. But be sure that your fabricator is using U·S·S Stainless Steel. This perfected, service-tested material is available in every form—sheets, strip, plates, tubes, wire, special sections—permitting the widest latitude in design and the most modern techniques of fabrication. Specifying "U·S·S Stainless Steel" is a sure step to satisfactory performance.

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Rubber parts featuring **LONG LIFE** and **MINIMUM SWELL** now can be fabricated from new compounds which will withstand the chemical action of petroleum products and their derivatives as well as industrial and commercial lubricants. Oil and gasoline-resistant rubber parts can be supplied to fit many applications in the automotive, chemical processing, aviation, electrical, and industrial equipment manufacturing industries.

Parts made from the new compounds can have tensile strength from 500 to 2500 psi, durometer hardness from 40 to 90, and elongation from 100 to 600%. Oxident additives will provide weatherproof qualities.

Gaskets, sleeves, washers, tubing, and molded parts and extruded cross-sections can be furnished to meet either S.A.E. requirements or specific applicational needs.

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CUSTOM RUBBER FABRICATORS

SAE Meetings

(*Continued from page 52*)

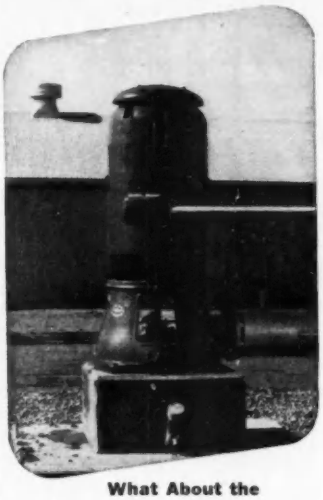
acid will fracture visibly at unit strain of about the same order of magnitude as the elastic limit when applied to 53-ST alloy sheet whereas for chromic acid films the unit strain of fracture is four or five times the elastic limit of the base metal. Since it has been shown that the chemical constitution and molecular arrangement of the films are identical, it is very possible that these wide differences in unit strain of fracture can only be accounted for by consideration of stress concentration due to the greatly reduced net section of the outer surfaces of the thicker sulphuric acid films. This reduced section is due to the inverted conical shape of the sulphuric anodizing film. The fracture initiates at the granular outer surface of these films (which granular surface is lacking in ordinary chromic acid films) and proceeds as a sharp notch downward through the oxide film. In structures dynamically stressed, the stress concentration at the base of these cracks initiates a notch fracture in the base metal itself which, after prolonged exposure to alternating loads, is to be expected. When designing aluminum alloy parts subject to high cyclic stresses it is recommended that in addition to the following of design practices discussed in the book, "Prevention of the Failure of Metals Under Repeated Stress," chromic anodizing be used exclusively.

Air Conditioning of Automotive Vehicles

By A. T. Browne,
ACF-Brill Motors Co.

PROBABLY the first automotive vehicle to be air conditioned was a semi-trailer bus which was placed in operation on the almost legendary Damascus-Bagdad run in 1936. Two years later the first fleet of air conditioned intercity buses appeared in revenue operation on the western lines of the Santa Fe Trails. The acceptance of air conditioning in the field of intercity bus transportation was rapid, and today air conditioning is standard equipment on most intercity buses. In the postwar period the most spectacular advance in transportation air conditioning has been in the field of city transportation. Air conditioned city vehicles are now operating in Atlanta, Georgia and San Antonio, Texas. Indications are that within the next few years the air conditioned private automobile may make its appearance.

To the engineer concerned with the air conditioning of automotive vehicles there are three thermodynamic cycles of refrigeration of interest: the vapor compression, the air cycles, and the adsorption. The vapor compression sys-



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Bonderite treatment prior to painting is simple and uniform in performance, effective in results, economical in cost, and fast enough to match any production line's pace.

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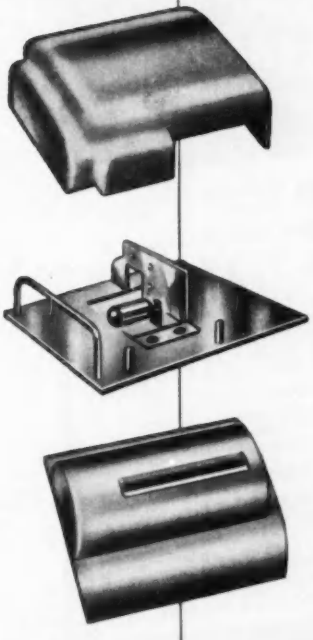
Get full information on Bonderite for die castings. Write today for *Free* technical bulletin.



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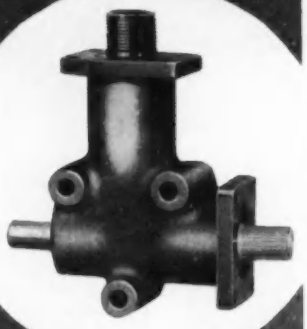
ANGLE Gear



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tem is used universally at present for the comfort cooling of automotive vehicles, and indications are that it will continue to dominate this field for some time to come, unless future developments in the adsorption, or the air cycle system make either of these systems more adaptable for use in automotive vehicles.

Brake Drum Materials

By Fred J. Walls
The International Nickel Co., Inc.

THE designing engineer has at his command many known factors arrived at through endless testing, studies of service conditions, and studies of failures, all of which help him to arrive at his compromise brake drum from design and material standpoints. The life expectancy of a brake drum can be summed up as follows: (A) Resistance to thermal fatigue; (B) Resistance to wear and galling or scoring; (C) Resistance to mechanical breakage.

Thermal fatigue is a function of design, expansion, conductivity, rate of heat input and the number of cyclic heatings. Wear and galling are functions of structure, hardness and fusion point. Mechanical breakage is a function of strength and design.

While the title of this paper implied that there may be many suitable materials for brake drums it seems apparent for the present at least that high total carbon cast irons fulfill the requirements of the braking surface to a greater extent than any known alloy discovered to date. This is verified by experience and theory and by unsuccessful attempts to utilize other alloys.

Classified Advertisements

Internal Combustion Engine Development: More horsepower from small displacement. Good economy, smooth operation, compact. Higher compression with curb gas. Engine available for demonstration. 15 patent grants and applications. Aged inventor desires outright sale. Box 74, Automotive Industries, 5601 Chestnut St., Philadelphia 39, Pa.

WANTED — PRODUCTION ENGINEER with several years of technical training and considerable administrative experience for highly responsible position with automotive manufacturer in mid-west. Must have thorough knowledge of and experience with the processes, layout, tooling, sheet metal and dies, planning and expediting of operations of a large manufacturing plant. Excellent references required. This position is one with good salary and unlimited opportunity. Indicate training, experience and salary requirement in first reply. Address Box 83, Automotive Industries, 5601 Chestnut Street, Philadelphia 39, Pa.

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American and Foreign Standards for Ball and Roller Bearings

By F. Leister, Fafnir Bearing Co.
and R. M. Riblet,
The Timken Roller Bearing Co.

Efforts toward international unification of the dimensions of ball and roller bearings started on the European Continent after World War I. These efforts, however, were unsuccessful and the International Standards Association was abolished during World War II.

When, after the past World War, international cooperation in standardization was resumed under the procedure of the International Organization for Standardization (ISO), the work of the old ISA committee was taken over by a like committee of the ISO.

The text of the problem confronting this committee is that ball and cylindrical roller bearings, which are measured in the metric system, are not interchangeable with tapered roller bearings which are measured in inches, in all countries.

At the recent ISO committee meeting in Paris, there was considerable discussion on the subject of tapered roller bearing measurement standardization. Sweden adheres very strongly to the metric proposal which is adopted practice in that country; while the United States stated that the metric proposal would cause American industry to manufacture a separate line of metric bearings which would obviously be uneconomical.

It may be said that the active participation of American industry in the work of the ISO committee on Ball and Roller Bearings has yielded the following results: Changes in the ISO plan of boundary dimensions for radial bearings (other than tapered roller bearings) desirable from the American point of view, will be given further consideration. American industry will take an active part in the formulation of the scope of the work and the establishment of a program, including the assignment of priorities to different subjects. Finally, the standardization of tapered roller bearings, in which little consideration has been given so far to the American viewpoint, has now been assigned for advice to a subcommittee on which the U. S. is represented and for which it has assumed the secretariat. In would seem, therefore, that from now on the American viewpoint may be expected to get more consideration than it has received before and that the U. S. consequently will be able to exert such leadership as is justified by its prominent position in the world's antifriction bearing industry.

The above is an abstract of a paper presented at the Thirty-first Annual Meeting of the American Standards Association in New York.

Expert Engineering Collaboration...

SEASONED BY LONG EXPERIENCE

For more than a quarter-century Inland has been acquiring a practiced knowledge of various industrial materials . . . metals, rubber, plastics, friction substances. More important, Inland has conducted successful research, followed by practical and economical production, in *combining* two or more such materials into literally hundreds of large and small parts used in the automotive and other industries of importance.

Mere ingenuity of design has never sufficed as an Inland standard. Always Inland's end objective has been to apply new design to effect simplification, manufacturing short cuts, more economical mass production . . . *lowered costs.* And always, in Inland's own production, continuous and precise laboratory control has assured exact duplication of manufactured parts, even in enormous volumes.

You are invited to call on Inland for engineering collaboration. The size of the part, piece or problem that may be troubling you . . . doesn't matter at all. The only thing that counts, in the Inland view, is *your* satisfaction, resulting from the *successful industrial solution of the problem.*

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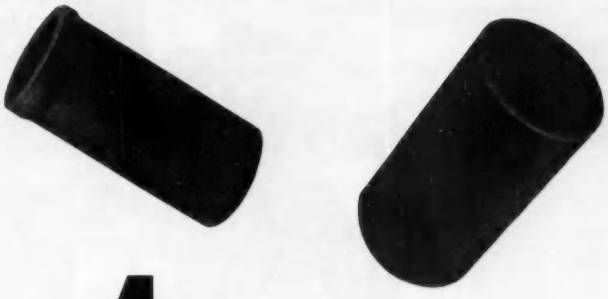
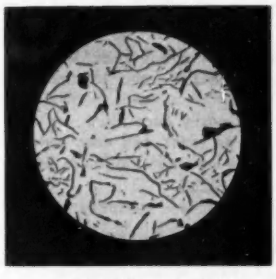


4 CONTROLLED "TYPE A" GRAPHITE *SLEEVE IRONS*

1000X MAGNIFICATION
Note the Type A graphite pattern and completely pearlitic matrix.



100X MAGNIFICATION
Type A graphite extends throughout entire wearing structure of iron.

Centrifugally cast from electric furnace metals in permanent molds — either alloyed or unalloyed.

These 4 new sleeve irons may be specified either as cast or annealed — suitable for hardening up to 600 Brinell. Hardness can be controlled between 200-300 Brinell as cast.

What it means to YOUR PRODUCTION COSTS

Lower original cost than any other comparable castings. Lower scrap loss (as low as 1.3%). Finishing operations reduced because less stock to be removed (in some cases, approximately 1/16") and castings dimensions held to closer tolerances. For equal hardness, there is better machinability. Castings sold rough machined or as rough castings.

What it means to ENGINE PERFORMANCE

In addition to other advantages of Centrifugal castings, these 4 irons, according to some authorities, will give greater wear and better dry lubrication due to the *controlled* "Type A" graphite pattern.

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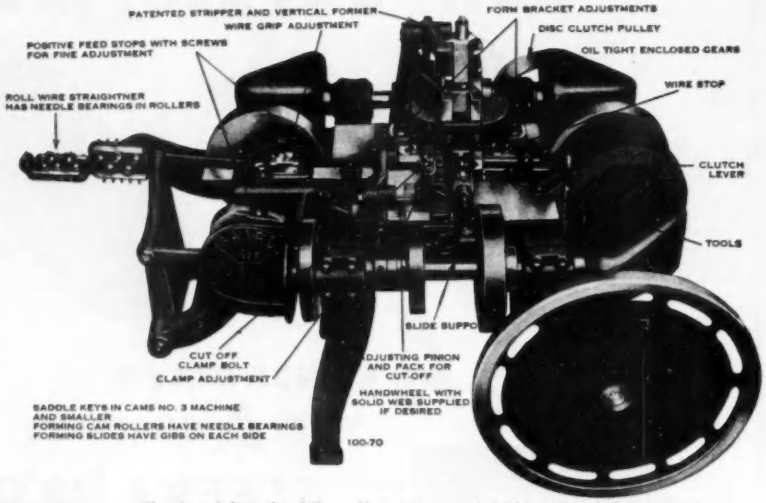
Centrifugally cast electric alloys - exclusively heat-treated for Super Duty

BAIRD *Automatic* WIRE and RIBBON METAL FORMING MACHINES

For High Production of those Wire and Ribbon Metal Articles which can be made to best advantage on a Four Slide Machine.

By this we mean without having to use "cluttered up" tooling.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POSITIVE FEED STOPS WITH SCREWS FOR FINE ADJUSTMENT
ROLL WIRE STRAIGHTNER HAS NEEDLE BEARINGS IN ROLLERS
WIRE STOP
CLUTCH LEVER
TOOLS
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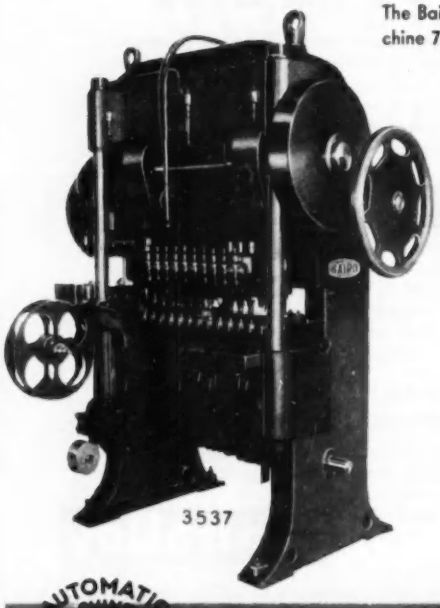
CUT OFF CLAMP BOLT CLAMP ADJUSTMENT
DJUSTING PINION AND PACK FOR CUT-OFF
HANDWHEEL WITH SOLID WEB SUPPLIED IF DESIRED
SADDLE KEYS IN CAMS NO. 3 MACHINE AND SMALLER
FORMING CAM ROLLERS HAVE NEEDLE BEARINGS
FORMING SLIDES HAVE GIBS ON EACH SIDE
100-70

The Baird Standard Four Slide Wire and Ribbon Metal Forming Machine 7 Sizes. May be with Horizontal Press and other Attachments.



BAIRD *Automatic* MULTIPLE TRANSFER PRESSES

For those parts made from ribbon metal which can be made to best advantage on this Baird Multiple Transfer Press.

Tools plainly visible and easily accessible.

Different combinations of crank and cam gate shafts, roll and slide feeds, etc., to best suit the job in hand.

5 SIZES

Send your samples and prints and quantity requirements and

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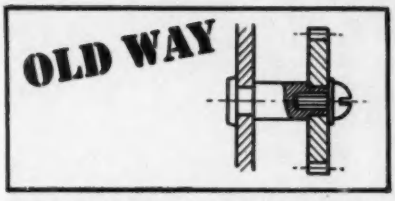
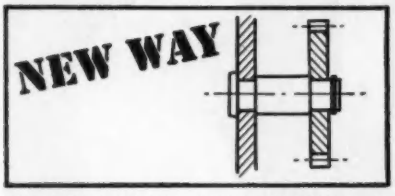
The BAIRD MACHINE COMPANY, Stratford, Conn.

BUILDERS OF HIGH PRODUCTION MACHINE TOOLS • MULTIPLE SPINDLE CHUCKING MACHINES AND GRINDERS • OBLIQUE AND HORIZONTAL TUMBLING MACHINES

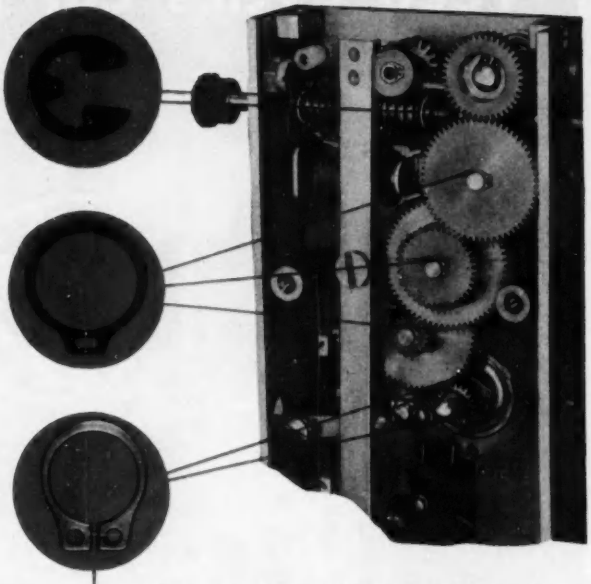
Redesign with TRUARC cuts unit cost 42¢ saves 7½ minutes assembly time



SCREW AND WASHER HOLD FLOATING GEAR IN PLACE in old model newspaper facsimile recorder. Gear stud may rotate at pivoted end, making removal of screw difficult. Screw head takes up valuable space.



TRUARC RING REPLACES SCREW AND WASHER in this typical application. Truarc Ring saves space, makes assembly-disassembly quicker and easier. No screw slots to get burred up.



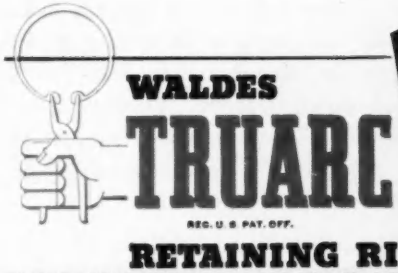
Not only do 22 Truarc Rings save time and money in production for Times Facsimile Corporation, New York. They also make maintenance easier and faster—a basic advantage in a machine on duty 24 hours a day.

Redesign with Truarc Rings and you too will save! Wherever you use machined shoulders, nuts, bolts, screws, snap rings, cotter pins, there's a Truarc Ring that does a better job of holding parts together.

Find out what Truarc Rings can do for you. Send your blueprints to Waldes Truarc engineers for individual attention without obligation.

22 WALDES TRUARC RINGS GIVE THESE BIG ADVANTAGES:

- **½ inch space saving permits money-saving use of standard relay rack.**
- **7½ minutes assembly time saving.**
- **42¢ overall unit cost saving.**
- **Replace tapping with simple grooving operation.**
- **Speed maintenance because Truarc Rings are easy to assemble and disassemble... can be used over and over again.**



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How Combined Automatic Vertical and Horizontal Feed Cycles Cut Milling Costs

Sundstrand Model 22 Rigidmil provided with vertical feed attachment for milling turbine blades.

Quick Set-Up Cycle Combinations Handle Wide Range of Parts and Cuts

This manufacturer handles many different sizes of parts on his Sundstrand Model 22 Rigidmil. He reports an average saving of 47% per piece over the former method. In addition, finish has been improved and cutter life increased.

Although it is a Standard Rigidmil, it has been equipped with a standard vertical feed attachment, which provides up to 4 intermittent cuts as shown in cycle diagrams on opposite page. The machine can easily be set-up to cycle for roughing cut and recycle (automatically) for a finish cut at different depths. The machine is equipped with a mechanical feed box, which provides 100 to 1 feed ratio. Spindle speed ratio is 80 to 1.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS U.S.A.

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

Typical Example:

Savings Average 47% Per Piece

Shown above is a turbine blade as it comes to the Sundstrand Model 22 Rigidmil (above) and after milling operation has been performed. An almost endless variety of these blades are processed over this machine. Types of cuts include concave and convex milling. Rough and finish cuts are performed on some pieces *within the same machine cycle.* Possible cycle combinations are shown at right.

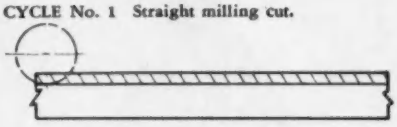
Get These Facts

Complete information on the Sundstrand Model 22 Rigidmil is included in this 8 page folder. Write for your copy today. Ask for bulletin No. 292.

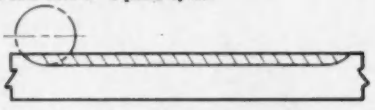
Possible Cycle Combinations

Combining table cycles with vertical feed cycles of spindle head makes it possible to obtain a variety of combinations to handle a wide range of parts and cuts. The first five cycles illustrated below are used on the installation described at left. The 6th cycle is available when machine is equipped for four different depths of feed to the spindle head.

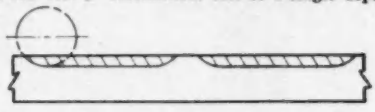
CYCLE No. 1 Straight milling cut.



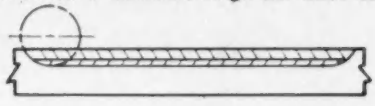
CYCLE No. 2 Square cycle.



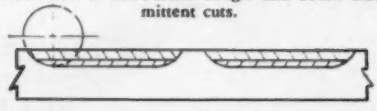
CYCLE No. 3 Intermittent cuts to a single depth.



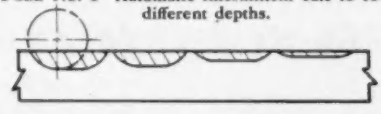
CYCLE No. 4 Automatic rough and finish cuts.



CYCLE No. 5 Automatic rough and finish intermittent cuts.



CYCLE No. 6 Automatic intermittent cuts to four different depths.



NOTE: Cycles 1, 2 and 3 can be obtained with standard vertical feed attachment and table control dogs. Cycles 4, 5 and 6 require extra electrical equipment and control dogs.

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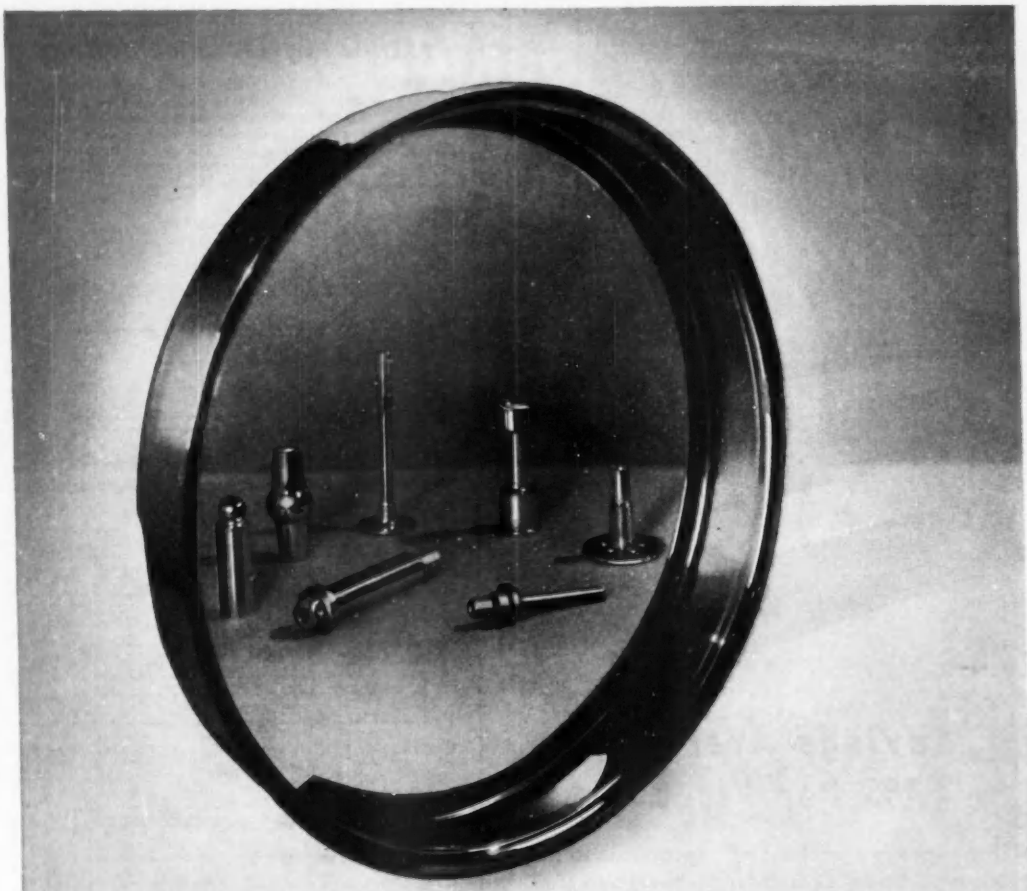

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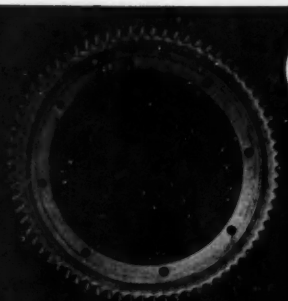
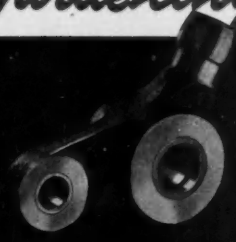
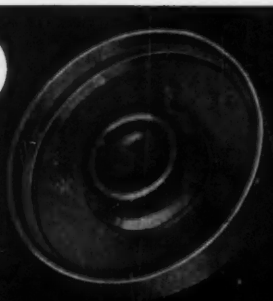
Hardening



Production up from 14 to 35 per hour, and savings of $82,507 per year on this International Harvester gear.



Over 4¢ saved on every part, 600 parts per hour when Lima-Hamilton TOCCO-hardens these shifting levers.



Hardening costs cut 80% by TOCCO-hardening wearing area of Link Belt Company conveyor trolley wheels.

Brazing

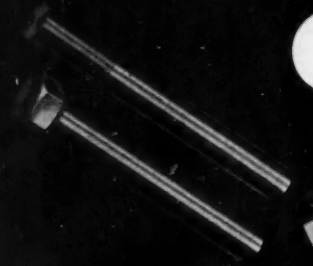
Kennametal, Inc. brazes carbide tips on these mining machine bits and hardens shanks at the same time. Output—one every 20 seconds.

Nash Motors cuts cost 60%, triples hourly output by TOCCO-brazing drain flanges to automotive oil pans.

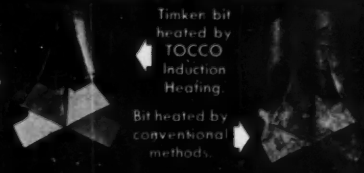
←TOCCO brazed in 15 seconds.

A 6¢ TOCCO-brazing job saves $17.00 tools—saves $2,000 a month at a midwest automotive parts plant.

Forging



H. M. Harper boosts production up to 265% and die life up to 400% by TOCCO-heating nonferrous bolt blanks for forging.



Timken bit heated by TOCCO Induction Heating.

Bit heated by conventional methods.

Scale was reduced from 2.79% to .79% by applying TOCCO to heating bar stock for forging rock drill bits at Timken Roller Bearing Company.

3⅜" x 7" x 1" Billet

Tractor track link forging.

Forging die life tripled and scale reduced over 99% when Willy's Overland Commercial Forge Plant installed TOCCO Induction Heating for forging.

All These Jobs, And Probably Some of Yours, Can Be Done Faster, Better and at Lower Cost with TOCCO® Induction Heating

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The 14th Fleet Operators' Reference Annual

APRIL, 1950

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—will be the 14th Fleet Operators' Reference Annual, out in April.

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This April issue will cover: Truck and Bus Maintenance . . . Truck and Bus Selection and Operation . . . Truck, Bus and Trailer Statistics. Included, for the first time this year, will be complete specification tables and complete maintenance specifications on standard American buses.

This issue is your Number 1 advertising buy in the truck and bus fleet maintenance field in 1950. Final forms close March 20.

COMMERCIAL CAR JOURNAL

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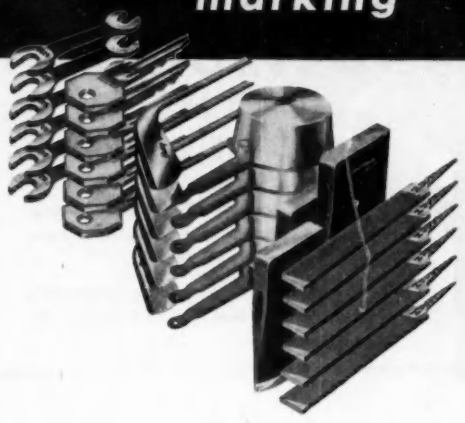

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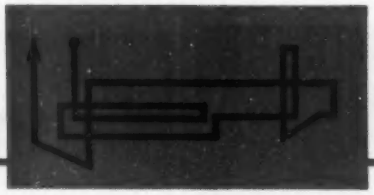
Follow this  Tool Path

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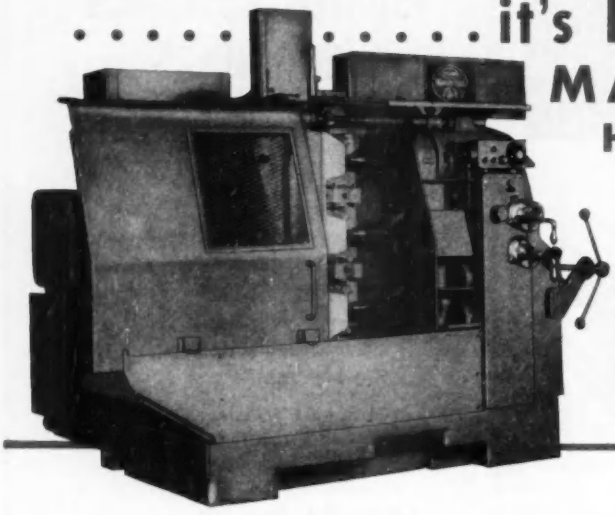

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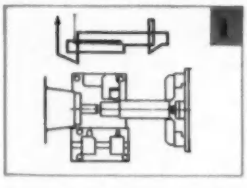
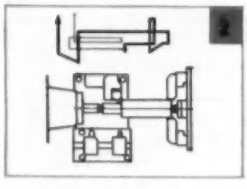
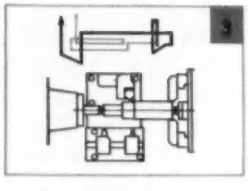


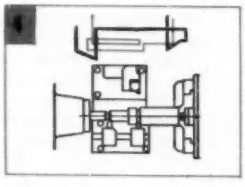


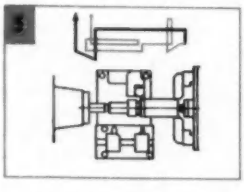


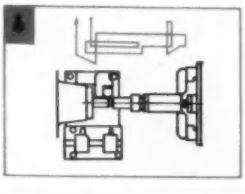
Man-Au-Trol has no predetermined sequence of operating functions, except when set for a given job. No cams are used for the movement of saddle or tool slide or for dwell at the end of a cut. Repetitive accuracy and uniformity of finished work is assured. 1 Drive pinion Shaft SAE 3250 Bar Stock steel (size 3" x 11¾") 1st. Oper. rough turn. 2 2nd Oper. Finish turn to size. 3 3rd Oper. finish turn to size. 4 4th Oper. Lower tools groove and chamfer end. 5 5th Oper. Upper tool enters groove generates 30 degree angle and finish turns to shoulder. 6 6th Oper. finish face end of shaft. Production per hour 52 pieces.

16MM SOUND MOTION PICTURE

Showing the setup and operation of the Bullard 30H Lathe is available for group showing. — When writing advise your preferred date.







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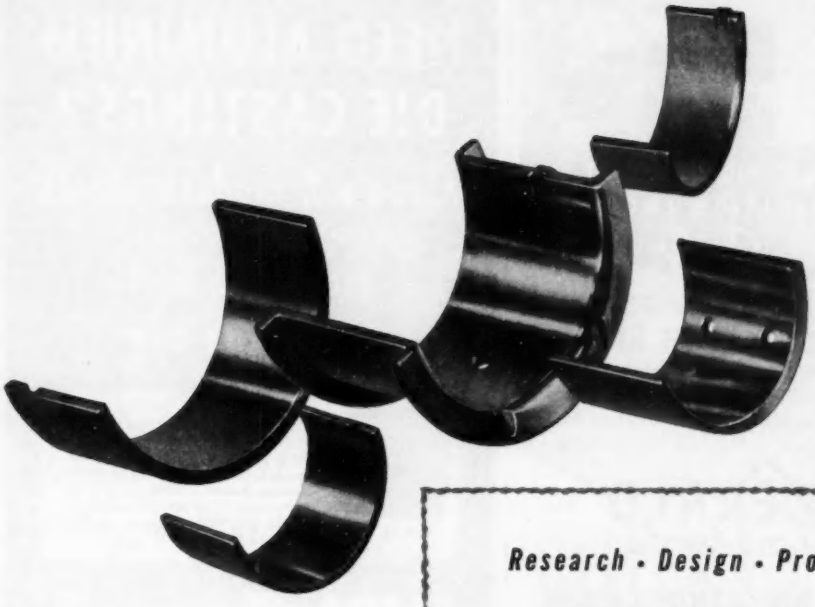

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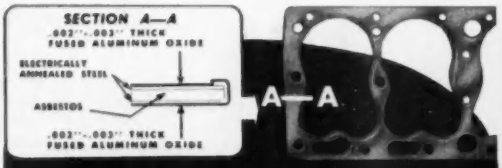

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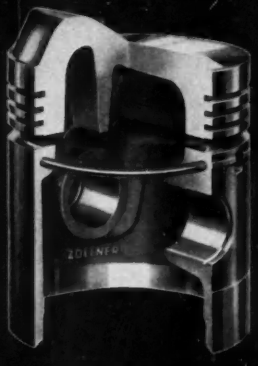

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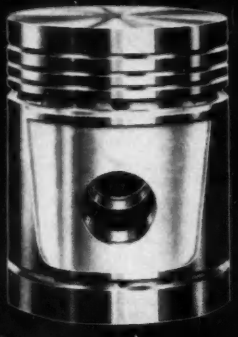

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